

# A REVISION OF THE INDO-PACIFIC LABRID FISH GENUS *MACROPHARYNGODON*, WITH DESCRIPTIONS OF FIVE NEW SPECIES

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## ABSTRACT

The tropical Indo-Pacific labrid genus *Macropharyngodon* of small (to 125 mm SL) reef fishes is distinctive in its single large molariform tooth of the lower pharyngeal plate (flanked by 1 to 3 small blunt conical teeth), a large canine at the corner of the mouth, a restricted free margin of the preopercle, IX dorsal spines and 11 (12 in one species) dorsal and anal rays, and a continuous lateral line of 27 pored scales. Nine species are recognized (five described as new): *geoffroy* (Quoy and Gaimard), a blue-spotted Hawaiian endemic with 14 to 16 gill rakers and relatively deep body (depth 2.3-2.6 in SL); *cyanoguttatus* from Mauritius and Réunion, also blue-spotted (the females with whitish caudal fin and yellow dorsally on head and antero-dorsally on body) with 17 or 18 gill rakers; the common *meleagris* (Valenciennes) in Cuvier and Valenciennes (*pardalis*, named for the female, is a junior synonym) from the central and western Pacific and Cocos-Keeling in the Indian Ocean, the females whitish with numerous large black spots, the males orange-red with a green spot on each scale, a black spot containing a few smaller yellow spots on shoulder, and green bands on head; *ornatus* from Indonesia, western Australia, and Sri Lanka, the females orange-red on head, thorax, and abdomen, with greenish yellow bands and spots, shading to blackish over most of body with yellow-green spots (one per scale), the males similar but darker generally; *bipartitus* Smith from the western Indian Ocean (*varialvus*, named for the female form, is a junior synonym), the females orange with white spots and a large black area over thorax and abdomen containing a reticulum of bright blue, the males with green bands on head and anteriorly on body and a large "U"-shaped blackish mark in caudal fin (a subspecies, *marisrubri*, is proposed for the Red Sea population based on different color pattern of the male and a slightly lower gill-raker count); *choati* from eastern Australia with 13 pectoral rays, distinctively colored white on body with irregular bands and blotches of orange, and a large black blotch topped with yellow on opercle; *negrosensis* Herre from western Oceania, Philippines, and Ryukus which is blackish on body with small pale spots (females) or scales edged with light greenish (males), the anal and pelvic fins black, the caudal fin abruptly pale (except blackish lobes in males); *vivienae*, known from a single specimen from Madagascar which is distinctive in having 8 to 18 pores in anterior lateral-line scales (1 to 4 on other species), 13 pectoral rays, and a very large black blotch containing small blue spots in humeral region and a yellow spot dorsally on opercular flap; and *kuiteri* from eastern Australia and New Caledonia with 12 dorsal and anal soft rays, spatulate teeth, and a large black spot, rimmed in blue, on opercle.

*Macropharyngodon* is a genus of colorful tropical Indo-Pacific reef fishes of the family Labridae (popularly known as wrasses). The fishes of this genus are relatively small (maximum standard length about 125 mm). The genus seems most closely related to *Halichoeres* with which it is grouped by Norman (1957) in the subfamily Julidinae (=Cori-

nae), the largest of the nine subfamilies of his classification.

*Macropharyngodon* was established by Bleeker (1861) for *Julis geoffroy* Quoy and Gaimard, described from the Hawaiian Islands. At that time only one other species now classified in *Macropharyngodon* was known, *Julis meleagris* Valenciennes in Cu-

vier and Valenciennes from the Caroline Islands. Bleeker regarded the two as synonymous.

In 1867, Kner described *Leptojulius pardalis* from Fiji. Günther (1871) and Seale (1901) each created synonyms for this form. Curiously, *pardalis* was not recognized as a *Macropharyngodon* until de Beaufort (1939).

In 1932, Herre named *Macropharyngodon negrosensis* from the Philippines.

De Beaufort (1940) stated that three or four species of the genus *Macropharyngodon* have been described from the subtropical and tropical parts of the Pacific, adding that perhaps they are only varieties of a single species.

Smith (1957) described two species in the genus, *bipartitus* and *varialvus*, from the western Indian Ocean.

Schultz in Schultz and collaborators (1960) included only three species in his key to *Macropharyngodon*: *geoffroy* (which he correctly cited as restricted to Hawaii), *meleagris*, and *pardalis*. He overlooked the species described by Herre and by Smith. His key is based solely on color. This is understandable, for the species of this genus are relatively uniform in meristic and morphometric characters.

Bauchot (1963) stated that the holotype of *Julis lamarii* Valenciennes in Cuvier and Valenciennes could not be a *Thalassoma*, as other authors have indicated, but placed it in *Macropharyngodon*. The author examined the type of *Julis lamarii* in Paris. Although the condition of the specimen is poor, it can be identified as *Halichoeres marginatus* Rüppell. Axelrod and Emmens (1969) also made the mistake of identifying *Halichoeres marginatus* as a *Macropharyngodon*; they named it *M. meleagris*.

In the present paper it will be shown that *pardalis* is the female form of *meleagris*, and *varialvus* the female of *bipartitus*. In each case the name of the male has priority. Thus, the known species of *Macropharyngodon* are reduced to four: *geoffroy*, *meleagris*, *negrosensis*, and *bipartitus*. In addition, five

new species and one subspecies are described, largely from collections made in recent years by the author.

All species of *Macropharyngodon* are sexually dichromatic, though to a varying degree (only one specimen of *vivienae* known, hence not considered in this respect). No males were found in the primary color phase with the exception of one *M. bipartitus* of the "*varialvus*" form which has a small gonad that appears to be a developing testis (see account of *bipartitus*).

*Macropharyngodon* is not well represented by specimens in the museums of the world. Nearly all from Pacific collections are *M. meleagris*. Material of the genus was examined at the following institutions: Academy of Natural Sciences of Philadelphia, Australian Museum in Sydney, Bernice P. Bishop Museum in Honolulu, British Museum (Natural History) in London, California Academy of Sciences in San Francisco, Muséum National d'Histoire Naturelle in Paris, National Taiwan University in Taipei, Senckenberg Museum in Frankfurt, United States National Museum of Natural History in Washington, D.C., University of Tokyo, Zoölogisch Museum in Amsterdam, and Zoologisches Museum in East Berlin.

The holotypes and some paratypes of the new species are in the Bishop Museum (BPBM). Other paratypes have been variously deposited in the Australian Museum (AMS), California Academy of Sciences (CAS and SU), Hebrew University, Jerusalem (HUJ), J. L. B. Smith Institute of Ichthyology, Grahamstown, South Africa (RUSI), U.S. National Museum of Natural History (USNM), Western Australian Museum at Perth (WAM), and the Zoölogisch Museum at Amsterdam (ZMA). The author gratefully acknowledges the assistance of the staffs of the departments of ichthyology of all these institutions.

Special thanks are due Rudie H. Kuiter of Sydney, Barry C. Russell of the Australian Museum, and Pierre Fourmanoir of ORSTOM, Noumea, for providing specimens and photographs of *Macropharyngodon kui-*

*teri*, Gerald R. Allen of the Western Australian Museum for specimens of *M. ornatus* and *M. choati*, and Mireille L. Harmelin-Vivien of the Station Marine d'Endoume et Centre d'Océanographie in Marseille for the specimen and drawing of *M. vivienae*.

The opportunity to make fish collections in Oceania, which included valuable specimens of *Macropharyngodon*, was provided by grants from the National Geographic Society; in Indonesia and Sri Lanka indirectly from the Foreign Currency Program of the Smithsonian Institution; in Mauritius from the American Philosophical Society; and in the Red Sea from the U.S.-Israel Binational Science Foundation.

Counts and measurements were made in the manner described by Randall (1972). In the descriptions of new species and the one subspecies, data presented in parentheses apply to paratypes if different from the holotype. More complete measurement data are given in the tables than in the text. Characters such as the number of lateral-line scales and vertebrae which are the same for all the species are given only in the generic description.

### *Macropharyngodon*

*Macropharyngodon* Bleeker, 1861: 412 (type species *Julis geoffroy* Quoy and Gaimard, by original designation).

Body moderately deep, the depth 2.34–3.12 in standard length (SL), and compressed, the width (measured just posterior to head) 2.35–3.12 in depth; head 2.82–3.34 in SL; snout 2.94–4.0 in head; orbit diameter 4.0–5.9 in head; least depth of caudal peduncle 1.65–2.18 in head; caudal peduncle deeper than long, the length (measured horizontally between rear base of anal fin and base of caudal fin) 1.5–2.5 in least depth. Mouth terminal, horizontal, not large, the maxillary ending anterior to a vertical at front edge of eye; lips not very fleshy, the anterior margins of both often slightly crenulate or irregular (may be a result of preservation against projecting anterior canines); inner lateral surfaces of lips plicate, the

upper with 4 or 5 longitudinal plicae and the lower with 1 or 2 (inner ones more fleshy and papillose); teeth conical (except in *kuiteri* where they approach a spatulate form), projecting diagonally forward in jaws, the upper jaw with two pairs of enlarged canines anteriorly, the first pair nearly straight and strongly projecting, the second markedly recurved (except in *kuiteri* where they serve to buttress the anterior pair); teeth on sides of jaws in one row, progressively smaller posteriorly, except for a large canine at rear of upper jaw which projects diagonally forward and downward from corner of mouth; lower pharyngeal plate with a large oval molariform tooth (the occlusal surface of which is broadly concave) in mid-posterior position, the greatest length of the enamel portion contained 3.5 to 4.8 times in snout length (Fig. 1c, d), large molar with one to three small low conical teeth antero-laterally on each side (except *kuiteri* in which one of the three teeth is a bicuspid of moderate size); median limb of lower pharyngeal plate with a row of 5 to 9 low conical teeth (the first generally the longest and sharpest); paired upper pharyngeal plates with two prominent molariform teeth, one in front of the other (on *geoffroy*, *cyanoguttatus*, and *negrosensis* there may be a third smaller posterior molar; on some specimens this is present on one side and absent on the other) (Fig. 1a, b); upper molars flattened medially where they abut teeth of other side; anterior upper molar on each side preceded by a group of 4 to 8 low stout conical teeth, the more anterior ones the longest (pharyngeal dentition not dissected from the single type specimen of *vivienae*). Nostrils small, anterior to upper half of eye, the anterior nostril terminating in a short membranous tube, the posterior with a small flap at the front. Gill membranes attached to isthmus with a free fold across; 6 branchiostegal rays; gill rakers short, 14 to 19 on first arch (including rudiments) (Table 1). Preopercle entire, the free upper margin not reaching level of lower edge of eye (usually not extending above level of

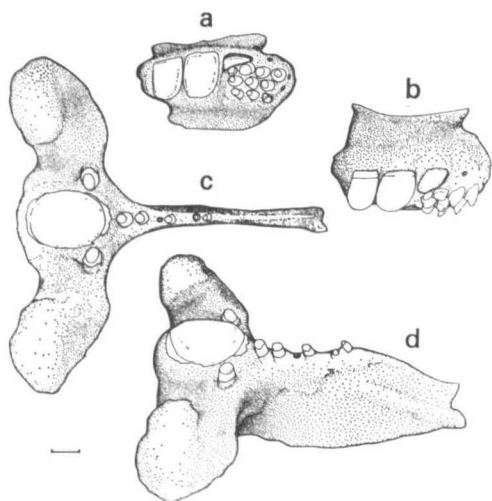


Figure 1. Pharyngeal plates of *Macropharyngodon goeffroy*, 110 mm SL: a and b, uppers; c and d, lower (drawing by Janet R. Gomon).

mouth), the lower margin very short, extending little beyond the rounded corner. Head naked; no median predorsal scales (4 or 5 diagonal rows of progressively smaller scales extend anterior to dorsal fin on side of nape); thin cycloid scales on body, smaller on thorax (isthmus and anterior and ventral part of thorax naked except for partially embedded small pre-ventral scales); fins naked except for small scales on base of caudal fin and one mid-ventral scale at base of pelvic fins. Lateral line complete, angling downward to straight peduncular portion beneath last three or four dorsal rays, the pored scales 27 to caudal base (plus one beyond hypural); 4 to 6 scales above lateral line to origin of dorsal fin and 9 to 11 scales below lateral line to origin of anal fin. Origin of dorsal fin slightly anterior to upper end of gill opening; dorsal rays IX,11 (except *kuiteri* with 12), the last branched to base; first dorsal spine moderately long, 4.25–6.35 in head; last dorsal spine the longest, 2.48–3.85 in head (for some species the second and third or third and fourth spines are slightly longer than fifth or sixth, but for most the spines are progressively longer from first to ninth);

Table 1. Gill-raker counts of species of *Macropharyngodon*

	14	15	16	17	18	19
<i>geoffroy</i>	1	9	4			
<i>cyanoguttatus</i>				3	3	
<i>meleagris</i>		1	9	15	5	1
<i>ornatus</i>		1	7	8	1	
<i>bipartitus bipartitus</i>		1	6	6	3	1
<i>bipartitus marisrubri</i>	2	5	4	1		
<i>choati</i>			2	2	1	1
<i>negrosensis</i>	1	4	5	4	1	
<i>vivienae</i>				1		
<i>kuiteri</i>			3	3	1	1

longest dorsal ray 1.83–2.50 in head; origin of anal fin beneath anterior soft portion of dorsal fin (generally vertically below first soft interradiar membrane); anal rays III,11 (12 in *kuiteri*), the last branched to base; first anal spine very slender, narrowly spaced from second spine, its length 5.52–10.7 in head; third anal spine 3.18–4.52 in head; longest anal soft ray 1.79–2.53 in head; 14 principal caudal rays, the median 12 branched; caudal fin slightly rounded (truncate in some specimens of *negrosensis*), 1.2–1.48 in head; pectoral fins with 12 rays (except *choati* with 13), the uppermost a short bony splint, the second unbranched; pectoral fin length 1.27–1.51 in head; pelvic fin rays I,5; origin of pelvic fins below upper base of pectoral fins; pelvic fins not long, usually not reaching anus, rarely reaching origin of anal fin, their length 1.16–2.16 in head. Vertebrae 25.

#### KEY TO THE SPECIES OF *Macropharyngodon*

- 1a. Dorsal and anal soft rays 11; teeth conical; caudal peduncle not short, the length 1.4 to 1.9 in least depth; color not as in 1b (if large black spot present on opercle, it is not rimmed with blue) ..... 2
- 1b. Dorsal and anal soft rays 12; teeth spatulate (except canine at corner of mouth); caudal peduncle short, the length 2.3 to 2.5 in least depth; color in life light orangish with a bluish white spot on each scale (body uniformly pale in preservative), a large black spot on opercle rimmed in blue and a small blackish spot behind eye (New Caledonia and eastern Australia south to Sydney) ..... *kuiteri*, n. sp.

- 2a. Pectoral rays 12 (including upper rudimentary ray); color not as in 2b ..... 3
- 2b. Pectoral rays 13 (including upper rudimentary ray); whitish in life with orange blotches and/or irregular longitudinal bands on body (body largely pale in preservative); a large black spot edged dorsally with yellow on opercle (eastern Australia and Great Barrier Reef) ..... *choati*, n. sp.
- 3a. Anterior lateral-line scales with 1 to 5 pores (usually 2 or 3); last dorsal and anal soft rays not the longest; color not as in 3b ..... 4
- 3b. Anterior lateral-line scales with 8 to 18 pores; last dorsal and anal soft rays the longest; a very large dark brown spot in humeral region (immediately above and behind upper edge of opercular flap); upper half of head abruptly dark brown except for a pale spot nearly as large as eye dorsally on opercular flap (Madagascar) ..... *viviennae*, n. sp.
- 4a. Body in life brown with a small black-edged blue spot at base of each scale (spots persisting as a darker brown in preservative or not at all); head yellowish to orangish (at least snout and dorsally) in life, hence paler than body in preservative, with dark-edged irregular narrow blue bands or elongate blue spots ..... 5
- 4b. Color not as in 4a (if spots present on body they are larger, on outer part of scales, not blue in centers, and persist as pale spots in preservative); if irregular bands present on head, they are not blue ..... 6
- 5a. Gill rakers 14 to 16; second and third dorsal spines longer than fifth and sixth; last dorsal spine 2.5 to 3 in head; body moderately deep, the depth 2.3 to 2.6 in SL; caudal fin of female spotted like body; blue spots on body of male vertically elongate except on nape and posteriorly where still round (Hawaiian Islands) ..... *geoffroy*
- 5b. Gill rakers 17 or 18; each dorsal spine slightly longer than preceding spine; last dorsal spine 3 to 3.4 in head; depth of body 2.6 to 2.9 in SL; caudal fin of female abruptly whitish; blue spots on body of male round (Mauritius and Réunion) ..... *cyanoguttatus*, n. sp.
- 6a. Anal and pelvic fins blackish except for a narrow blue margin and a row of faint dark blue-green spots on base of anal; with broad blackish upper and lower margin; body primarily blackish with faint pale spotting in female (male with light greenish edges on scales); specimens from Oceania with four diffuse saddle-like pale yellowish areas on back and one on nape (Philippines, Ryukyu, and western Oceania) ..... *negrosensis*
- 6b. Anal and pelvic fins not blackish (though there may be dark markings); caudal fin not whitish in life; body not colored as in 6a ..... 7
- 7a. Color in life of female orange with pale spots and a large black area over abdomen and thorax containing a reticulum of bright blue; males reddish with diagonal dark-edged blue or green bands on head which continue anteriorly on body; a large dark reddish to blackish band in caudal fin shaped like an "U" (on side) ..... 8
- 7b. Color not as in 7a ..... 9
- 8a. Males with green bands anteriorly on body horizontal, slightly irregular, and nearly reaching middle of body; an orange or yellow area dorsally on posterior half of body nearly divided by a reddish spot; a dark reddish to blackish band edged in bright blue on side of caudal peduncle below orange or yellow dorsal area; gill rakers 15 to 19 (western Indian Ocean) ..... *bipartitus bipartitus*
- 8b. Males with green bands anteriorly on body irregular, soon breaking into spots and short bands; no orange or yellow area dorsally on posterior half of body; a diffuse blackish band on side of body posteriorly but invaded by light green spots and not edged in blue; gill rakers 14 to 17 (Red Sea) ..... *bipartitus marisrubri*, n. subsp.
- 9a. Females whitish to light greenish with numerous irregular black spots; males reddish with dark-edged green spots (one per scale) on body, a black humeral spot containing small yellowish spots, and dark edged green or greenish yellow spots and bands on head (tropical central and western Pacific and Cocos-Keeling Islands) ..... *meleagris*
- 9b. Females reddish anteriorly, shading to blackish posteriorly, with greenish yellow spots edged in blue and black (one per scale) on body and similar spots and irregular bands on head; males similar in color to females, with no black humeral spot (Indonesia, Sri Lanka, and western Australia) ..... *ornatus*, n. sp.

*Macropharyngodon geoffroy*  
Figures 1, 2, 3A, and 3B

*Julis geoffroy* Quoy and Gaimard, 1824: 270, pl. 56, fig. 3 (type locality, Hawaiian Islands).

*Macropharyngodon aquilolo* Jenkins, 1901: 46, fig. 1 (type locality, Honolulu).

**Diagnosis.**—Dorsal rays IX,11; anal rays III,11; pectoral rays 12; gill rakers 14 to 16; anterior lateral-line scales with 2 or 3 pores; body relatively deep, the depth 2.34–2.63 in SL; third dorsal spine (second and fourth generally subequal) longer than fifth or sixth spines; last dorsal spine 2.48–3.03 in head (other species 3.02–3.85); pelvic fins relatively long, reaching to or beyond anus (to or slightly beyond anal origin in some individuals, especially large males).

Color in alcohol brown, sometimes darker

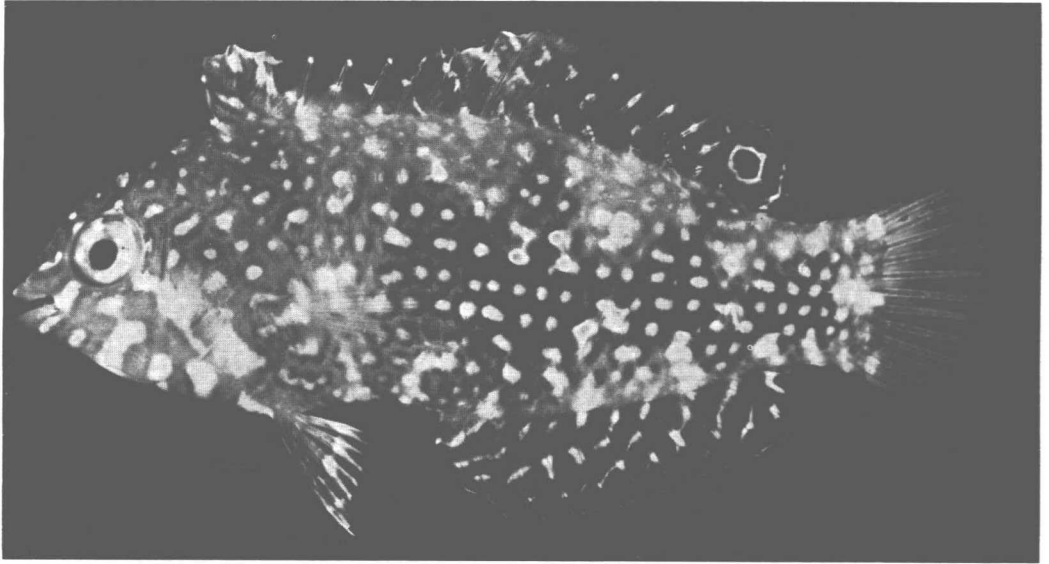


Figure 2. Juvenile of *Macropharyngodon geoffroy*, 38 mm SL, Hawaiian Islands.

posteriorly, with a dark brown spot on each scale; head lighter brown with narrow dark brown bands and scattered elongate spots; no prominent dark spots on isthmus; median fins with rows of dark-edged brown spots, the dorsal with a large black spot anteriorly on basal half of fin, the black pigment curving dorsally onto rays; first three interspinous membranes clear above black spot; paired fins pale, the pectorals with a broad blackish bar at base. Dark spots on body of male vertically elongate except on nape and caudal peduncle; males often have a broad pale bar on side beneath pectoral fin (this bar is broader ventrally and is accentuated by adjacent dusky zones). The 38-mm juvenile of Figure 2 is pale in alcohol with large irregular brown blotches containing dark spots on sides and ventrally; a black spot posteriorly in dorsal and anal fins.

In life the ground color of adults is yellow-orange except where dusky, the spots and bands bright blue with black edges; the clear outer membranes of the dorsal fin above the anterior black spot are bright red and yellow in the male.

*Remarks.*—This species of *Macropharyngodon* was the first described. Three syntypes are in the Muséum National d'Histoire Naturelle in Paris (MNHN A.9200, 86–97 mm SL); the largest is here designated as lectotype (and retains the museum number). The paralectotypes have been registered with a new number, MNHN B.2775.

*M. geoffroy* is known only from the Hawaiian Islands where it is the only member of the genus. The name, however, has been mistakenly applied to other species outside of Hawaii. Bleeker (1856 and 1862) used it for *ornatus*, and Günther (1862) for the same species (after Bleeker) and for *meleagris*. Macleay (1884), Steindachner (1906), Fowler (1928 and 1956), Fowler and Bean (1928), and Kamohara (1957 and 1963) also erred in identifying *meleagris* as *geoffroy*.

*M. geoffroy* is not a common species. The author has collected it in the depth range of 6 to 32 m. The largest Bishop Museum specimen measures 125 mm SL (BPBM 4590).

Hobson (1974) reported prosobranch gastropods and foraminifera as the dominant



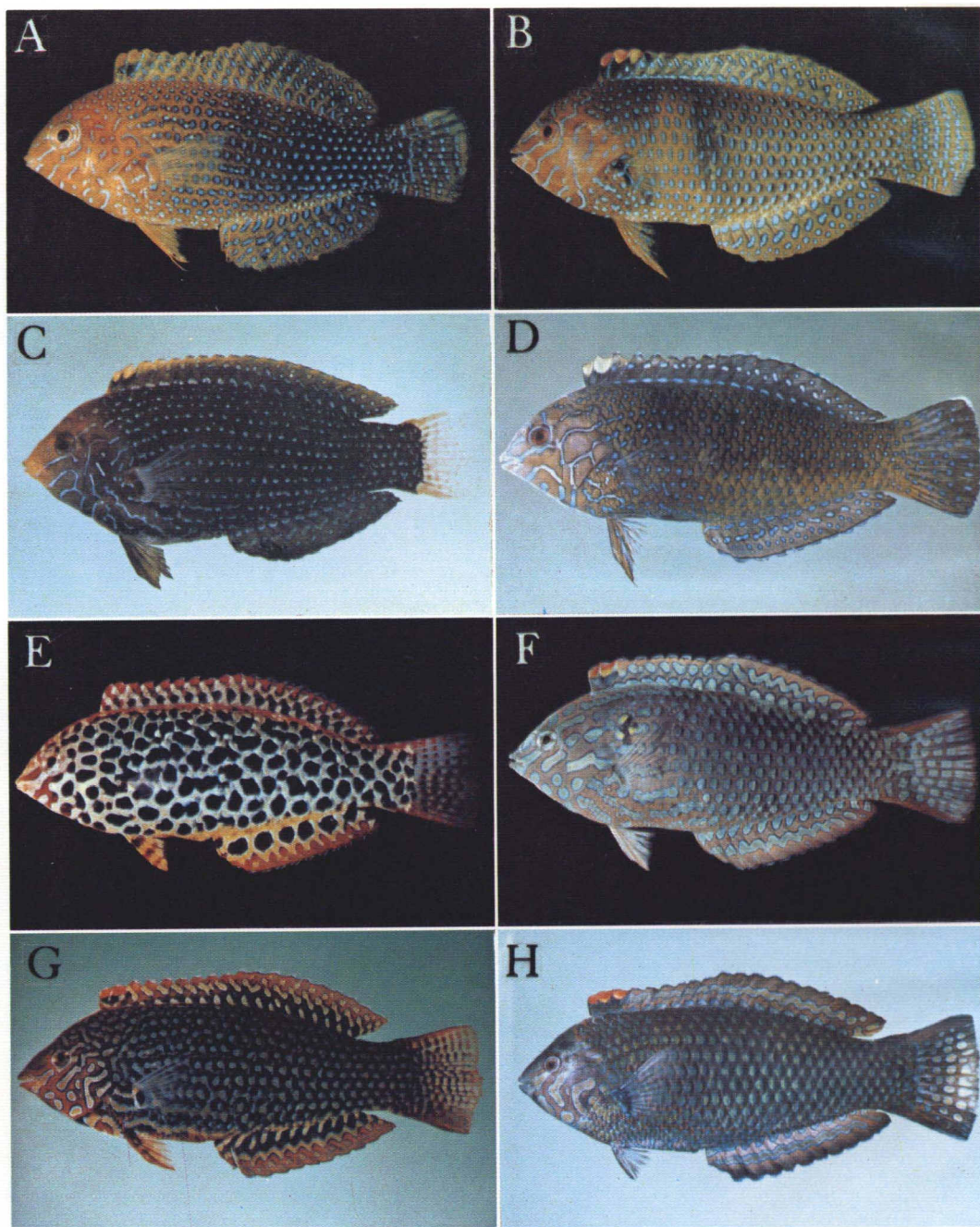


Figure 3. A. *Macropharyngodon geoffroy*, 59 mm SL, female, Hawaiian Islands, BPBM 7308; B. *Macropharyngodon geoffroy*, 88 mm SL, male, Hawaiian Islands, BPBM 8492; C. *Macropharyngodon cyanoguttatus*, paratype, 92.9 mm SL, female, Réunion, BPBM 16291; D. *Macropharyngodon cyanoguttatus*, holotype, 93.5 mm SL, male, Mauritius, BPBM 16362; E. *Macropharyngodon meleagris*, 68 mm SL, female, Marshall Islands, BPBM 8028; F. *Macropharyngodon meleagris*, 85 mm SL, male, Palau Islands, BPBM 9373; G. *Macropharyngodon ornatus*, paratype, 106 mm SL, female, Molucca Islands, Indonesia, BPBM 18522; H. *Macropharyngodon ornatus*, holotype, 116 mm SL, male, Molucca Islands, Indonesia, BPBM 18546.

Table 2. Measurements of type specimens of *Macropharyngodon cyanoguttatus* (expressed as a percentage of the standard length)

	Holotype BPBM 16362	Paratypes				
		RUSI 836	BPBM 16321	USNM 215260	MNHN 1976-3	BPBM 16291
Standard length (mm)	93.5	52.5	60.0	75.2	77.3	92.9
Depth of body	34.2	35.2	34.8	35.9	36.4	38.8
Width of body	13.8	12.5	12.8	13.2	12.7	14.5
Head length	32.0	33.4	31.1	32.8	33.0	31.4
Snout length	10.6	10.1	9.2	10.0	9.6	9.5
Orbit diameter	6.0	7.6	7.7	6.9	6.5	5.9
Bony interorbital width	7.0	7.6	7.3	7.6	7.1	7.1
Length of upper jaw	9.3	8.0	8.3	8.0	8.2	8.8
Least depth of caudal peduncle	17.1	17.1	16.0	17.0	15.9	16.4
Length of caudal peduncle	10.4	9.7	9.2	9.7	9.6	10.5
Snout to origin of dorsal fin	28.3	29.5	28.0	27.9	28.6	27.9
Snout to origin of anal fin	54.5	55.0	54.3	56.3	55.8	56.0
Length of caudal fin	23.2	24.8	24.0	22.9	22.7	23.4
Length of pectoral fin	24.2	—	23.0	23.8	23.9	24.6
Length of pelvic fin	22.0	20.0	18.8	20.0	19.8	20.6
Length of first dorsal spine	6.6	7.0	6.5	6.4	6.3	6.8
Length of second dorsal spine	—	8.6	7.8	7.6	7.4	8.5
Length of last dorsal spine	9.5	10.3	10.3	9.7	10.2	9.9
Length of longest dorsal ray	14.8	15.4	15.3	14.3	14.7	15.1
Length of dorsal fin base	65.7	65.5	63.7	66.5	67.0	66.7
Length of first anal spine	4.0	5.1	5.0	4.3	4.3	3.8
Length of second anal spine	6.2	7.1	7.0	6.3	6.5	6.2
Length of third anal spine	8.8	—	9.2	9.6	9.3	8.7
Length of longest anal ray	14.6	14.9	15.0	14.7	15.0	14.7
Length of anal fin base	39.7	39.4	38.3	38.3	38.0	39.8

food items from the gut of eight specimens taken on the Kona coast of Hawaii.

***Macropharyngodon cyanoguttatus***  
new species

Figure 3C, 3D, and Table 2

*Holotype*.—BPBM 16362, 93.5 mm SL, male, Mauritius, west coast about 1.5 km north of Flic en Flac, reef in 40 m, spear, J. E. Randall, 1 December 1973.

*Paratypes*.—BPBM 16291, 92.9 mm SL, ripe female, Réunion, west coast off Villa Bourbon (south of Cap des Châteaux) (23°3'S, 55°13'E); reef in 10 m, spear, J. E. Randall, 21 October 1973; RUSI 836, 52.5 mm SL, Mauritius, aquarium of Paul Jauffret, J. E. Randall and M. M. Smith, 2 November 1973; BPBM 16321, 60 mm SL, female, Mauritius, reef 1.6 km NE Grande Baie, 18 m, spear, J. E. Randall, 14 November 1975; MNHN 1976-3, 77.3 mm SL, female, Mauritius, reef off Grand Baie, 23 m, spear, J. E. Randall, 23 November 1973; USNM 215260, 75.2 mm SL, female, same data as preceding.

*Description*.—Dorsal rays IX,11; anal rays

III,11; pectoral rays 12; gill rakers 18 (17 or 18).

Depth of body 2.92 (2.58–2.88) in SL; width of body 2.48 (2.72–2.87) in depth; head length 3.12 (3.0–3.22) in SL; snout 3.02 (2.98–3.44) in head; orbit diameter 5.35 (4.04–5.32) in head; least depth of caudal peduncle 1.87 (1.92–2.07) in head; caudal fin slightly rounded, 1.38 (1.30–1.48) in head; pectoral fins 1.41 (1.27–1.38) in head; pelvic fins may or may not reach anus, 1.45 (1.21–1.72) in head; first dorsal spine 4.85 (4.63–5.24) in head; remaining spines progressively longer, the ninth 3.38 (3.02–3.39) in head; seventh to tenth dorsal soft rays the longest, 2.16 (2.03–2.29) in head; first anal spine 8.02 (6.20–8.25) in head; third anal spine 3.63 (3.38–3.62) in head; fourth to ninth anal rays the longest, 2.19 (2.07–2.24) in head.

Upper jaw with two pairs of enlarged



canines anteriorly, the first pair straight and jutting strongly forward, the second smaller (these teeth seem relatively shorter on larger individuals) with tips recurved; 7 (5-7) progressively smaller pointed teeth along side of jaw, and a very large canine posteriorly (nearly as large as anterior pair of canines); lower jaw with two pairs of enlarged canine teeth anteriorly, straight to slightly curved and of about equal size; 8 (6-9) progressively smaller teeth on side of jaw. Large molariform tooth of lower pharyngeal plate with two small low conical teeth on each side, the more anterior one the smallest.

Two or three (rarely one) pores in each scale of anterior straight portion of lateral line, and one or two pores in descending and straight peduncular portions.

Color of the male holotype in alcohol: body brown with a faint darker brown spot on each scale; head light brown with faint irregular dark-edged brown bands; dorsal fin brown with a narrow whitish margin and dark brown submarginal line, two rows of dark-edged spots in spinous portion (one at extreme base of fin), and three in soft portion; two large black spots anteriorly in basal part of dorsal fin (one on each interspinous membrane), the membranes above the spots clear; anal fin brown with narrow whitish margin, dark brown submarginal line, and three rows of dark-edged spots; caudal fin dark brown with a narrow pale posterior border (broadest on upper corner) and faint dark-edged spots on fin rays; pectoral fins with whitish rays and clear membranes; pelvics brown except last two interradial membranes which are largely clear.

In life the male is dusky yellowish with black-edged bright blue spots except for thorax where there is a reticular pattern of dark-edged blue bands; head dull pinkish shading on nape and ventrally to dusky yellowish with a network of narrow black-edged blue bands; median fins colored like body, the margin of the dorsal bluish white, the distal part of the first two interspinous membranes light yellow (some yellow pig-

ment carrying over to third membrane); margin of upper corner of caudal fin whitish and of lower corner blue; margin of anal fin blue; pectoral fins pale; lateral half of pelvic fins brown with blue longitudinal bands, the rays of medial half tinged with blue and brown, the membranes mostly clear.

Color in alcohol of females brown with a dark-edged lighter brown spot on each scale; head lighter brown with irregular dark-edged pale bands and spots, the snout, dorsal part of head, nape, and (to a varying degree) antero-dorsal part of body pale; dorsal and anal fins similar to the male except outer part of dorsal which is paler (pale zone more extensive on smaller individuals, the smallest paratype with the fin completely pale except for basal part of soft portion); unscaled part of caudal fin abruptly whitish; pectoral fins pale; pelvic fins brown.

In life the females also have black-edged blue markings; the snout and upper part of head are yellow (as well as antero-dorsal part of body of smaller individuals); the caudal fin is white lightly tinged with pink, with small faint reddish or yellow spots on fin rays forming vertical bands basally on fin (largest female with orange-yellow basally on uppermost and lowermost rays); pectoral fins whitish with a dark brown bar at base; pelvics brown, tinged with yellow, the smaller individuals spotted with pale bluish; two smallest females with a blackish spot larger than pupil posteriorly in dorsal fin.

*Remarks.*—This species has been collected and observed only in Mauritius and Réunion. It might be expected to occur also in Madagascar and Rodriguez. It is not common in the Mascarenes; only two individuals of the male form were seen in 6 weeks of field work in Mauritius and Réunion.

The linking of the one male individual with the females is without the benefit of sufficient specimens to be certain of the conspecificity; however, in view of the similarity in color and general morphology, there is little doubt that the two phases represent the same species. Also the holotype was

swimming in the company of a female-phase fish when it was speared.

Named *cyanoguttatus* in reference to the bright blue spots which are found in both sexes.

*Macropharyngodon meleagris*

Figures 3E, 3F, and 4

*Julis meleagris* Valenciennes in Cuvier and Valenciennes, 1839: 481 (type locality, Uléa).

*Leptojulis pardalis* Kner, 1867: 728, pl. 3, fig. 2 (type locality, Viti, Fiji Islands).

*PlatyGLOSSUS nigromaculatus* Günther, 1871: 666, pl. 65, fig. B (type locality, Savay, Samoa Islands).

*Halichoeres nigropunctatus* Seale, 1901: 89 (type locality, Guam).

**Diagnosis.**—Dorsal rays IX,11; anal rays III,11; pectoral rays 12; gill rakers 15 to 19; anterior lateral-line scales with 2 to 4 pores; depth of body 2.54–3.05 in SL; third dorsal spine of adults equal to or slightly shorter than fifth and sixth dorsal spines (second and third dorsal spines of juveniles generally longer than all other spines); pelvic fins short, not reaching anus.

Color of females (“*pardalis*” phase) in alcohol pale with close-set irregular black spots, some nearly as large as eye (spots sometimes co-joined); a mid-dorsal band free of black spots running from snout along back at base of dorsal fin to caudal peduncle; faint dark bands on snout, chin, across inter-orbital space, and on nape; dorsal and anal fins with a row of large dark spots along base; a row of dark-edged pale spots in outer part of dorsal and anal fins which are joined distally on soft portions of fins to form a continuous band; caudal fin pale with small dark spots on rays; paired fins pale.

In life the ground color of females is whitish to pale greenish; the bands anteriorly and dorsally on the head are red; the spot-free zone dorsally on the head and back is largely red; the dorsal and anal fins are yellow, the outer row of spots red; the spots on the caudal fin rays are red; the pelvic fins are yellow with three cross-bands of dark red.

Color of males in alcohol grayish brown

with a pale spot on each scale faintly rimmed in dark except posteriorly where the pigment is concentrated into a bar (spots joined or partially joined to form bands antero-dorsally on body); a blackish spot usually present above basal part of pectoral fin at level of upper end of gill opening; an intense black spot on isthmus bordered posteriorly by a pale band, the black pigment continuing forward on gill membranes to form a mid-ventral stripe on head; head gray brown with dark-edged bands and spots of variable pattern on different individuals; median fins with dark-edged pale spots, these joined to form an irregular band in middle of soft portions of dorsal and anal fins; a black spot on lower part of first two dorsal interspinous membranes, whitish on upper part; upper and lower edges of caudal fin a darker brown than rest of fin; paired fins pale.

In life the ground color of males is orange-red, the spots and bands green (closer inspection reveals the spots as greenish-yellow with a narrow margin of blue adjacent to the outer black rim; black spot on shoulder associated with one to three smaller bright yellow spots; region above black spot anteriorly in dorsal fin bright red and yellow; a narrow light blue margin on dorsal and anal fins; pectoral fins pale without a dark bar at base; pelvic fins whitish, blotched with pink.

A juvenile collected by the author in the Marshall Islands (BPBM 8004, 33.5 mm SL) was light green in life with faint orange edges on the scales and black spots on the head and approximately lower two-thirds of body (upper third and caudal peduncle nearly free of spots); dorsal and anal fins with irregular diagonal bands of orange-red; posteriorly in each of these fins a large black spot with a double rim of yellow (inner) and red.

**Remarks.**—An abstract of a paper presented in New York linked the sexual color phases of nine different labrid fishes, each phase of which had a different scientific name (Randall, 1969). Among these pairs was

*Macropharyngodon meleagris* and its junior synonym *M. pardalis* (the latter was described in *Leptojulius*, and specimens have often been reported in this genus, though distinct from *Macropharyngodon*). Of 65 specimens (49–96 mm SL) of the “*pardalis*” phase in which the gonads are well preserved, 63 are clearly females and two (USNM 113343, 101 mm SL; BPBM 8460, 80 mm SL) appear to be males (gonads of these two small and irregular with no ova present). Both of these fish are starting to change to the *meleagris* color pattern. The dark spots on the cheek and operculum have coalesced to form bands; the black spot is beginning to form anteriorly in the dorsal fin, and the dark spot on the isthmus has enlarged and become more heavily pigmented. Of 46 specimens (62–120 mm SL) of the *meleagris* form for which the sex can be determined, all are males.

*M. meleagris* was described by Valenciennes from the drawing of a 5-in. fish from Uléa (=Woleai, Caroline Islands).

The holotype of *Leptojulius pardalis* Kner from Ponape is in the Zoologisches Museum, Hamburg (Ladiges, 1958).

*M. meleagris* is the most common and widespread species of the genus in the Pacific. The author has collected specimens in the Society Islands, Tuamotu Archipelago, Marquesas Islands, Pitcairn Group, Samoa Islands, Line Islands, Marshall Islands, Gilbert Islands, Mariana Islands, Caroline Islands, Palau Islands, Solomon Islands, Lord Howe Island, and the Ryukyu Islands in depth range of 0.5 to 27.5 m. He observed the species on the Great Barrier Reef.

Rudie Kuiter of Sydney collected a male of *meleagris* 120 mm SL at North Solitary Island (29°25'S, 153°33'E), New South Wales and kindly sent a color photograph. He has observed juveniles of this species up to 100 miles south of Sydney (hence, about 35°20'S).

William F. Smith-Vaniz informed the author of the existence of a male from Nivatobutabu Island, Tonga Islands at the

Academy of Natural Sciences of Philadelphia (ANSP 134034, 81 mm SL).

Marshall (1950) reported the species by name only from the Cocos-Keeling Islands. The author examined two specimens [BM (NH) 1949.11.29.379, 50–107 mm SL] from these islands at the British Museum (Natural History). Nineteen other specimens (26–97 mm SL) from this locality were collected recently by William F. Smith-Vaniz and associates of the Academy of Natural Sciences of Philadelphia and sent on loan to the author.

Only one other record exists for the Indian Ocean, but it is erroneous. Smith (1957) reported the species (as *M. meleagris*) from Delagoa Bay, Mozambique from a faded specimen 73 mm in total length which he examined at the museum at Lourenço Marques. Margaret M. Smith has informed the author that this specimen was transferred to the J. L. B. Smith Institute of Ichthyology. She sent it on loan; it appears to be *M. ornatus* (see account of this species).

Fowler and Bean (1928) recorded *M. meleagris* (as *M. geoffroy* and *Leptojulius pardalis*) from the Philippines. Specimens in both color forms were examined at the U.S. National Museum of Natural History.

Macleay (1884) reported a specimen of *meleagris* from Hood Bay, New Guinea as *PlatyGLOSSUS geoffroyi*. This specimen was kindly sent by Lydia Bushell of the Macleay Museum, University of Sydney. The fish, a male of 101 mm SL, bears register number F.942 (see Remarks under *geoffroy* for other misidentifications of *meleagris* as *geoffroy*).

The specimen (ZMA 114.590, 82 mm SL) of *meleagris* reported from the Kei Islands, Indonesia by Weber (1913) and by de Beaufort (1940) is *ornatus*.

No specimens of *meleagris* have been found from Indonesia, and no individuals of this species were observed by the author during 6 weeks of field work at Ambon and the Seribu Islands off Jakarta.

Hiatt and Strasburg (1960) examined the stomach contents of five specimens of



Figure 4. Juvenile of *Macropharyngodon meleagris*, 28 mm SL, Palau Islands.

*meleagris* from the Marshall Islands. The food consisted of rock-dwelling gastropods (crushed by the heavy pharyngeal teeth) and foraminiferans.

***Macropharyngodon ornatus***

new species

Figures 3G, 3H, and Table 3

*Macropharyngodon Geoffroyi* Bleeker, 1862 (non Quoy and Gaimard): 129, pl. 37, fig. 5 (Manado, Celebes).

*PlatyGLOSSUS meleagris* Weber, 1913 (non Valenciennes in Cuvier and Valenciennes): 376 (Elat, Kei Islands, Indonesia).

**Holotype.**—BPBM 18546, 116 mm SL, male, Indonesia, Molucca Islands, Ambon, NW side of Ambon Bay near Sikula Point, fringing reef in 5 to 10 m, spear, J. E. Randall and G. R. Allen, 9 February 1975.

**Paratypes.**—RMNH 5115, 66 mm SL, female, Celebes (no further collecting data); ZMA 114.590, 82 mm SL, Indonesia, Kei Islands, Elat, Siboga Exp. Sta. 261, 16–18 December 1889; USNM 215272, 66.8 mm SL, female, Indonesia, Molucca Islands, Ambon, Latuhalat, Namalatu (3°47'S, 128°61'E), 10.5–18 m, rotenone, V. G. Springer, 14 March 1974; USNM 215273, 64.5 mm SL, female, Indonesia, Molucca Islands, NE Ambon, Tandjung Honimua (3°30'30"S, 128°20'E), 2.5–3 m, rotenone, V. G. Springer, 16 March 1974; AMS I.18568-001, 83 mm SL, female, Western Australia, Dampier Archipelago, Kendrew Island

(20°28'30"S, 116°32'E), spear and rotenone, G. R. Allen and R. Steene, 2 November 1974; WAM 24362, 108.4 mm SL, male, same locality as preceding, spear, B. Hutchins, 21 November 1974; BPBM 18522, 106 mm SL, female, Indonesia, Molucca Islands, Ambon, NW side of Ambon Bay, 1 km west of Sikula Point, fringing reef in 5 m, spear, J. E. Randall, 23 January 1975; BM(NH) 1976.1.13.1, 88.2 mm SL, female, Indonesia, Molucca Islands, Ambon, Latuhalat (SE corner of island), reef in 3 m, spear, G. R. Allen, 29 January 1975; BPBM 19630, 93.8 mm SL, female, same data as holotype; USNM 215027, 106.2 mm SL, male, same data as holotype; BPBM 18829, 2: 67.8–83.3 mm SL, smallest a female, largest a male, Sri Lanka (Ceylon), Trincomalee, Dutch Point, rocky shore, some coral, 2.5–6 m, spear, J. E. Randall, 2 April 1975; CAS 34700, 67.2 mm SL, female, data same as preceding; WAM P25371-011, 71 mm SL, male?, Western Australia, North West Cape, outer reef off Tantabiddi Cr., 15–18 m, spear, G. R. Allen, 30 June 1975.

**Description.**—Dorsal rays IX,11; anal rays III,11; pectoral rays 12; gill rakers 16 (15 to 18).

Depth of body 2.66 (2.67–2.76) in SL; width of body 2.59 (2.56–2.62) in depth; head length 3.24 (3.02–3.22) in SL; snout 3.09 (2.94–3.40) in head; orbit diameter 5.82 (4.8–5.9) in head; least depth of caudal peduncle 1.66 (1.68–1.95) in head; caudal fin slightly rounded, 1.31 (1.34–1.41) in

Table 3. Measurements of type specimens of *Macropharyngodon ornatus* (expressed as a percentage of the standard length)

	Holotype BPBM 18546	Paratypes				
		BPBM 18829	BM(NH) 1976.1.13.1	BPBM 19630	BPBM 18522	USNM 215027
Standard length (mm)	116.0	67.8	88.1	93.8	106.0	106.2
Depth of body	37.6	37.5	37.4	36.2	36.4	36.2
Width of body	14.5	14.3	14.5	13.9	14.2	14.3
Head length	30.9	32.6	33.1	32.5	30.9	32.4
Snout length	10.0	9.6	10.0	9.9	10.5	10.6
Orbit diameter	5.3	6.8	6.0	5.7	5.3	5.5
Bony interorbital width	7.0	6.9	7.4	7.5	7.2	7.1
Length of upper jaw	8.4	8.1	8.6	8.7	8.5	8.4
Least depth of caudal peduncle	18.6	17.4	17.0	17.5	18.4	18.5
Length of caudal peduncle	10.5	10.4	11.2	11.4	10.6	10.6
Snout to origin of dorsal fin	26.7	27.7	28.9	28.2	28.8	28.3
Snout to origin of anal fin	55.1	53.2	57.0	54.4	53.5	54.2
Length of caudal fin	23.6	23.3	23.4	23.3	22.9	24.2
Length of pectoral fin	22.2	22.4	22.1	22.2	22.0	22.1
Length of pelvic fin	14.3	18.0	17.3	18.0	17.2	18.3
Length of first dorsal spine	5.3	5.8	6.8	6.6	5.9	6.5
Length of second dorsal spine	6.9	7.2	7.7	7.6	6.8	7.4
Length of last dorsal spine	8.6	10.0	10.1	9.4	8.5	9.9
Length of longest dorsal ray	12.6	13.3	13.6	13.2	12.7	13.1
Length of dorsal fin base	68.8	66.6	64.6	65.2	66.0	67.9
Length of first anal spine	4.1	4.4	4.8	4.8	4.0	4.4
Length of second anal spine	5.4	6.0	6.8	6.3	5.4	5.6
Length of third anal spine	7.5	8.8	9.3	8.7	8.4	8.4
Length of longest anal ray	12.2	13.5	13.1	13.5	12.9	13.1
Length of anal fin base	41.0	41.2	37.9	39.0	40.2	39.2

head; pectoral fins 1.39 (1.4–1.5) in head; pelvic fins short, not reaching anus, 2.16 (1.77–1.91) in head (pelvic fins abnormal in holotype); first dorsal spine 5.82 (4.87–5.62) in head; remaining dorsal spines progressively longer, the ninth 3.60 (3.26–3.63) in head; fourth to ninth dorsal rays the longest, 2.45 (2.43–2.47) in head; first anal spine 7.55 (6.78–7.73) in head; third anal spine 4.12 (3.56–3.87) in head; fifth to seventh anal rays usually the longest, 2.53 (2.39–2.53) in head.

Upper jaw with two pairs of enlarged canines anteriorly, the first pair straight and jutting strongly forward, the second smaller with tips recurved; 6 (4–6) progressively smaller pointed teeth along side of jaw, and a very large canine posteriorly (one paratype from Sri Lanka with two large canines at corner of mouth on one side); lower jaw with two pairs of enlarged canine teeth an-

teriorly (one tooth missing on holotype), these teeth straight to slightly curved and usually of about equal size; 9 (7–9) progressively smaller teeth on side of jaw. Large molariform tooth of lower pharyngeal plate with a single small low blunt conical tooth on each side.

One to three (rarely one) pores in each scale of anterior straight portion of lateral line, and one or two pores in descending and straight peduncular portions.

Color of male holotype in alcohol: body dark brown, almost black, the edges of the scales lighter brown; head dark bluish gray with irregular dark-edged paler bands; chin, exposed gill membranes (mid-ventrally) and anterior thorax dark bluish (on 106.2-mm male paratype the chin is blackish, the gill membranes dark bluish, ending in a black spot anteriorly on thorax); dorsal and anal fins dark brown with a median wavy dark-

edged paler band, a basal row of dark-edged pale spots, a narrow pale margin (almost absent on anal) and dark submarginal line; basal two-thirds of first three interspinous membranes of dorsal fin black, the outer third (semicircular in shape) white; unscaled part of caudal fin with broad blackish upper and lower margins, the large median part of fin dusky with vertical rows of dark-edged pale spots (spots larger posteriorly in fin); pectoral fins with whitish rays (edges dark), clear membranes, and black at base; pelvic fins with blackish rays and nearly clear membranes.

Color of holotype when fresh: head blackish red with broad irregular bands and spots of greenish yellow narrowly edged in blue and black (one diagonal band begins broadly at edges of lips and passes to lower part of eye, emerging at upper posterior part of eye and continuing to side of nape; another more irregular band begins more anteriorly on snout, arcs around upper part of eye and passes to nape; a third on cheek commences near corner of preopercle, passes a short distance forward and upward, then turns at near right angles and continues to upper edge of gill opening; a fourth on lower operculum in approximate "C"-shape roughly parallels the third, its lower edge ending at subopercular margin; a large spot below this band and three above along lower edge of operculum; a short fifth band on lower side of head); lips bluish; body blackish red, the thorax and abdomen with irregular yellowish green bands edged with blue and black; rest of body with one spot of yellowish green per scale which have the same double border of blue and black anteriorly but on the sides and posteriorly the blue tends to be concentrated in a narrow bar at the back edge of each spot and the black is diffuse; dorsal and anal fins dusky red with a semicircular (triangular anteriorly) spot of yellowish green edged in blue and black at base of each interradial membrane, a wavy median longitudinal band of the same color, and a blue margin (paler on dorsal than anal); in addition, the dorsal is nearly black on lower part of first

three interspinous membranes (blue-edged greenish yellow spot shows faintly on basal part of each membrane) and bright red on outer part, the demarcation between the two colors curved on each membrane (the second two with a narrow arc of yellow separating the red and the black); caudal fin dusky orange-red, the upper and lower margins narrowly blue with a submarginal black line, with four vertical rows of large blue and black-edged greenish yellow spots, the outer row the largest (some indistinct small spots between outer row and posterior edge of fin); lobes of caudal fin largely free of spots; pectoral fins whitish with a broad blackish zone preceded by blue along base, some of the blackish pigment extending a short distance out on rays; pelvic fins dusky, the lateral edge blue, with a blue-edged red spot at base of rays and a second elongate red spot farther out on first ray.

Color in alcohol of females: body dark brown to blackish with a pale spot on each scale except thorax and abdomen where there are irregular longitudinal pale bands; a black spot on isthmus bordered posteriorly by a transverse dark-edged pale spot or band; head light brown with dark-edged pale irregular bands and spots; dorsal fin gray-brown, paler distally except for submarginal dark line, with two rows of dark-edged irregular pale spots (three in soft portion of some individuals); first two interspinous membranes of dorsal fin with black spots near base, the upper half translucent whitish (demarcation of dark and light on each membrane curved); anal fin similar to dorsal but with a very wavy median dark-edged pale band instead of a row of spots (the fin of 106-mm paratype is blackish below median pale band with a row of diagonal elongate pale spots); caudal fin dusky with dark-edged pale spots centered on rays, forming irregular vertical bands; pectoral fins pale with a black spot at base; pelvic fins pale, mottled with dark basally and laterally.

In life the females are orange-red on the head, thorax, and abdomen, shading to blackish over most of the body, with irregular



black-edged green bands and spots on head, thorax, and abdomen and green spots, one per scale, on rest of body (close analysis of green spots and bands reveals yellow centers and blue edges); median fins orange-red with rows of dark-edged greenish yellow spots; pectoral fins pale; pelvic fins light orange red, with or without blue-edged yellow spots.

*Remarks.*—This species has thus far been collected only in Indonesia, New Guinea, Sri Lanka, and Western Australia to a latitude of 20°28'S. It was not common at any of the localities where it was observed.

As stated in Remarks under *meleagris*, the specimen reported by Smith (1957) as this species from Delagoa Bay, Mozambique appears to be *ornatus*. This specimen (RUSI 4536, 64.5 mm SL) was sent on loan by Margaret M. Smith. It is a male with 17 gill rakers, and as noted by Smith (1957), it is faded. There is enough color, however, to be certain that it is not *meleagris*. There is no blackish spot in the humeral region, but a dark bar is visible on the pectoral base. Spotting in the median fins, though indistinct, is suggestive of *ornatus*. This specimen is not listed as a paratype, however, and the formal recording of the species in East Africa should await the collection of fresh material.

The female color phase of *M. ornatus* resembles the male of *M. meleagris*. This led Weber (1913) and de Beaufort (1940) to identify a specimen of this species from the Kei Islands, Indonesia as *meleagris*. This fish was examined at the Zoölogisch Museum of Amsterdam and is here designated a paratype. It was supposedly taken in Siboga Station 261 which was a dredge haul in 27 m on mud. It seems likely that some specimens attributed to this station were caught by some other means and in a different habitat, as this species is not apt to be found on a mud bottom in 27 m or be caught in a dredge.

The specimen 115 mm TL from Manado, Celebes reported by Bleeker (1856—reference copied) and illustrated in his *Atlas Ichthyologique* (1862, pl. 37, fig. 5) also seems to be *ornatus*. This specimen could not be

located at the Rijksmuseum van Natuurlijke Historie in Leiden or the British Museum (Natural History) in London. There is a specimen of *ornatus* at Leiden (RMNH 6852, 109 mm SL, 134 mm TL) collected by Bleeker of uncertain locality, but it is too large to be the one illustrated, and another (RMNH 5115, 66 mm SL, 82 mm TL) from Celebes, but it is too small; the latter is here regarded as a paratype.

This species is named *ornatus* in reference to its striking color pattern.

*Macropharyngodon bipartitus bipartitus*  
Figure 5C

*Macropharyngodon bipartitus* Smith, 1957: 104, col. pl. II B, text-fig. 2 (type locality, Pinda, Mozambique).

*Macropharyngodon varialvus* Smith, 1957: 105, col. pl. II A, text-fig. 3 (type locality, Pinda, Mozambique).

*Diagnosis.*—Dorsal rays IX, 11; anal rays III, 11; pectoral rays 12; gill rakers 15 to 19; anterior lateral-line scales with 2 or 3 pores; depth of body 2.62–3.05 in SL; third dorsal spine not longer than fifth or sixth spines; pelvic fins reach anus in male, but not in female.

Color of females in alcohol pale with a large black area containing a coarse pale network over thorax and abdomen (network better developed anteriorly), the upper end of dark area reaching to mid-depth; head pale with black spots on head except snout and suborbital region, those on interorbital space and nape small, the spots increasing in size onto postorbital region of head where some are elongate and curved; one or two slightly diagonal black lines on cheek below eye and sometimes a short black line running from eye toward corner of mouth; fins pale except pelvics which are black with two pale transverse bands.

In life the head is yellow, shading to orange on nape; body orange with white spots of variable size (all smaller than eye, with a large number of very small ones dorsally and on caudal peduncle); reticulum (and occasionally some isolated spots) in large black abdominal area bright blue; some

light blue-edged yellow spots on nape and postorbital head; large black spots on lower operculum edged in pale blue; a diagonal orange streak with a near-complete border of black (broader posteriorly) and an outer rim of light blue on cheek below eye; an orange streak, sometimes edged in blackish, from eye to corner of mouth; dorsal and anal fins orange with rows of white spots rimmed broadly in light blue and more narrowly in red, the membranous dorsal spine tips white and the margin of the soft portion of the fin whitish; unscaled portion of caudal fin pale yellowish with vertical bands of orange spots centered on fin rays; pectoral fins clear, the rays narrowly edged with light red; pelvic fins black, tinged with orange, with two white cross bars suffused laterally with pink.

Color in alcohol of males light gray-brown with diagonal black-edged darker gray-brown bands on head which continue horizontally on anterior part of body, becoming irregular and disappearing as they near middle of body; a semicircular pale yellowish area on back (about six scale rows in width) beneath soft portion of dorsal fin separated or almost separated from another pale area dorsally on caudal peduncle by a gray-brown spot at base of last three dorsal rays; pale areas bordered ventrally (and anteriorly for anterior area) by blackish blotches which coalesce into a solid and darker band on mid-side of caudal peduncle; dorsal fin gray-brown with a median black-edged band which becomes irregular on soft portion of fin; region below band on spinous portion of fin notably paler than band; outer part of fin pale with a narrow black line near margin; anal fin similar but distal pale part of fin nearly half the height of the fin; caudal fin pale with a large irregular U-shaped dusky marking edged narrowly in black, the middle part of the "U" nearly reaching posterior margin of fin; a few scattered small dusky black-edged spots in middle and upper part of pale central part of fin; paired fins pale.

Color when fresh orange-red, the bands on head and anteriorly on body green (closer

inspection reveals them as yellowish green with an inner margin of blue); large pale areas under soft portion of dorsal fin and on caudal peduncle yellow (Mauritius specimen) or orange (Maldives specimen) blackish spots and band along margins of pale areas edged in bright blue, the blue more evident on caudal peduncle; basal band in dorsal fin greenish yellow, edged in blue and black (this band breaking into triangular spots posteriorly where the blue border is broader, and there is no lower border); median band of fin dusky orangish to blackish; above this a blue-edged greenish yellow band which breaks up into a row of spots posteriorly (this band more dusky on Maldives specimen); distal part of fin orange with a submarginal black line; anal fin orange with a median dull green band and a row of greenish spots at base (narrowly edged in red on Mauritius specimen); large "U"-shaped band in caudal fin dusky orange (nearly black in Mauritius specimen), edged narrowly in black with an outer margin of blue; corners of fin green; central part of fin blue-green; pectoral fins pale yellowish, the rays narrowly dark-edged; pelvic fins orange over spine and first two rays, yellow over rest of fin, the lateral margin narrowly light blue.

*Remarks.*—The linking of *M. varialvus* as the female of the very differently colored *bipartitus* has been made with incomplete evidence. Although there is little doubt that these two forms are conspecific, the author admits that he would feel more confident if he had witnessed courtship or spawning, or observed an individual changing from the *varialvus* to the *bipartitus* color pattern. Only five specimens in the *bipartitus* form, 68–95 mm SL, were examined; these are all males. Of 12 adults in the *varialvus* phase, 52–71.5 mm SL; 11 are females, but one (ANSP 107545, 70 mm SL) is a male. Its gonad is small with numerous slender lobes of what appear to be developing testicular tissue. The specimen, however, does not show any obvious indication of change in color to the *bipartitus* pattern.

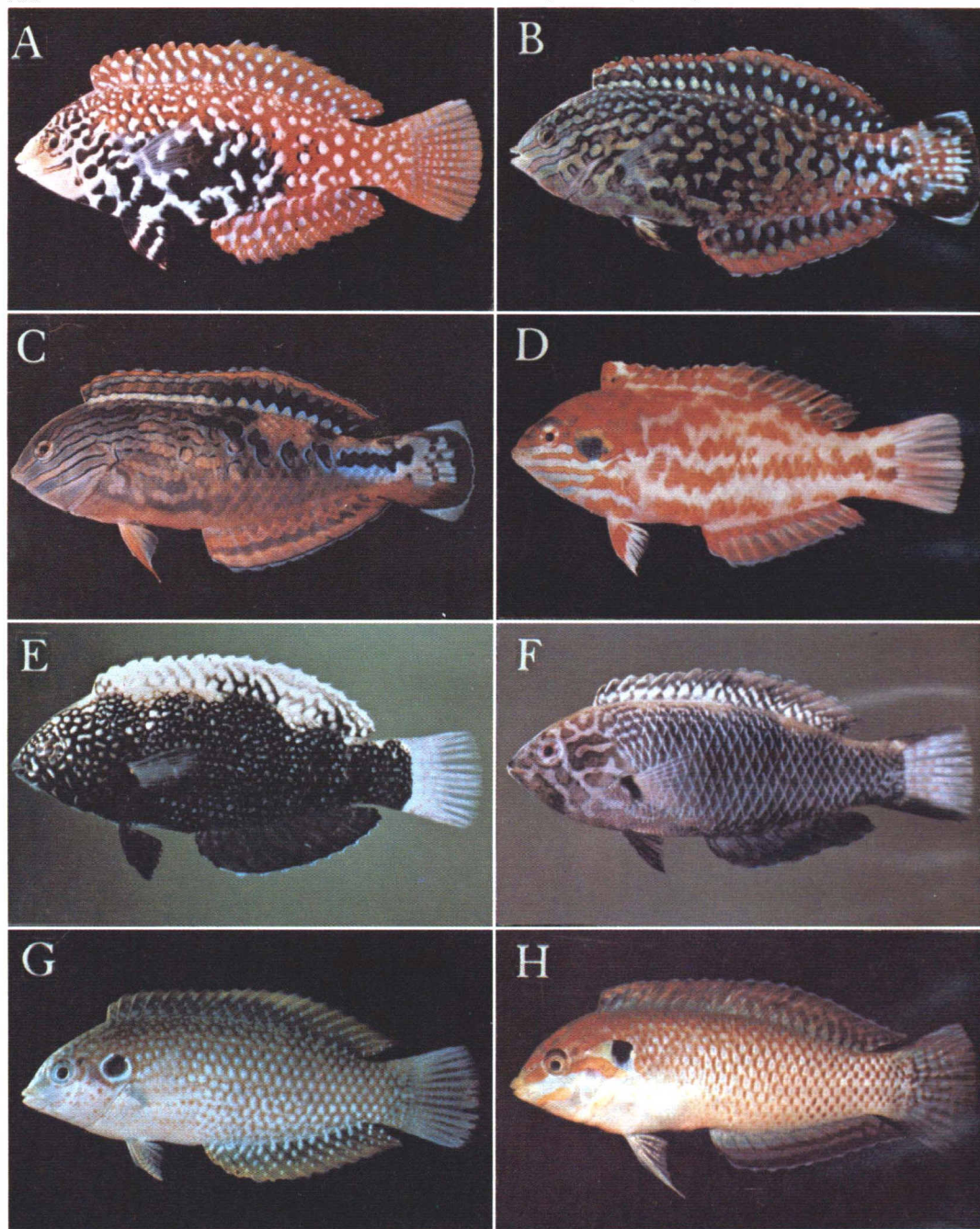


Figure 5. A. *Macropharyngodon bipartitus marisrubri*, paratype, 62.2 mm SL, female, Gulf of Aqaba, Red Sea, BPBM 13387; B. *Macropharyngodon bipartitus marisrubri*, holotype, 81.3 mm SL, male, Gulf of Aqaba, Red Sea, BPBM 13404; C. *Macropharyngodon bipartitus bipartitus*, 78 mm SL, male, Maldives, BPBM 18885; D. *Macropharyngodon choati*, holotype, 75.7 mm SL, male, Great Barrier Reef, Australia, BPBM 14359; E. *Macropharyngodon negrosensis*, 48 mm SL, female, Marshall Islands, BPBM 9278; F. *Macropharyngodon negrosensis*, 77 mm SL, male, Palau Islands, BPBM 9365; G. *Macropharyngodon kuiteri*, holotype, 60.5 mm SL, female, New South Wales, Australia, BPBM 19632; H. *Macropharyngodon kuiteri*, paratype, 76.2 mm SL, male, New South Wales, Australia, BPBM 19906.

The species is relatively rare in the three areas where it was collected by the author (Mauritius, Maldive Islands and the Red Sea in 10 to 30 m). Evidently, it is more common in the Seychelles, as the Academy of Natural Sciences has 22 lots from these islands.

The color illustration of the holotype in Smith does not show the yellow or orange dorsal areas under the soft dorsal fin and on caudal peduncle which are so evident on the Mauritius and Maldives male specimens. Also, Smith recorded 10 dorsal soft rays for this fish (his *varialvus* and all of the author's specimens have 11 rays).

The male color pattern in the Red Sea is somewhat different and the gill-raker counts are lower (Table 1); therefore, a Red Sea subspecies, *M. b. marisrubri*, is proposed. The description of the latter follows.

***Macropharyngodon bipartitus marisrubri***  
new subspecies

Figure 5A, 5B, and Table 4

**Holotype.**—BPBM 13404, 81.3 mm SL, male, Red Sea, Gulf of Aqaba, NW coast, Taba (S of Elat), reef in 12 m, dipnet, D. Fridman, 14 June 1972.

**Paratypes.**—HUI F7224, 2: 56.8–94.8 mm SL (female and male respectively), Red Sea, Gulf of Aqaba, Elat, dipnet, D. Fridman, 2 October 1967; USNM 215268, 38 mm SL, Red Sea, Gulf of Aqaba, NW coast, Marsa el Mukabila, reef near road, depth to 4.5 m, rotenone, V. G. Springer, 17 July 1969; USNM 215269, 2: 26.5–29.4 mm SL, Red Sea, Gulf of Aqaba, NW coast, bay at El Himeira, depth to 16 m, rotenone, V. G. Springer, 19 July 1969; HUI F5992, 30 mm SL, same data as preceding; USNM 215270, 57.1 mm SL, female, Red Sea, Gulf of Aqaba, NW coast, N of Ras Burka, depth to 10.5 m, rotenone, V. G. Springer, 23 July 1969; USNM 215271, 83.2 mm SL, male, Red Sea, Gulf of Aqaba, NW coast, between Marset Mahash el Ala and Marset Abu Samra (32 km by road S of marine laboratory at Elat), depth to 3.5 m, rotenone, V. G. Springer, 2 September 1969; BPBM 13387, 2: 51.6–62.2 mm SL, females, Red Sea, Gulf of Aqaba, NW end of Gulf at Elat, off Heinz Steinitz Marine Biology Laboratory, 12.5 m, spear, J. E. Randall, 7 June 1972; CAS 34699, 60 mm SL, female, same data as preceding.

**Description.**—Dorsal rays IX,11; anal rays III,11; pectoral rays 12; gill rakers 15 (14 to 17).

Depth of body 2.74 (2.59–2.61) in SL;

width of body 2.70 (2.80–3.11) in depth; head length 3.17 (2.98–3.0) in SL; snout 3.28 (3.46–3.70) in head; orbit diameter 5.25 (4.23–4.97) in head; least depth of caudal peduncle 1.79 (2.05–2.07) in head; caudal fin slightly rounded, 1.29 (1.20–1.29) in head; pectoral fins 1.43 (1.49–1.50) in head; pelvic fins of male reaching anus, 1.39 in head (shorter in females, not reaching anus, 1.76–1.78 in head); first dorsal spine 4.25 (4.55–5.24) in head; remaining dorsal spines progressively longer (though last four of one paratype subequal), the ninth 3.10 (3.20–3.25) in head; longest (usually fifth or sixth) dorsal soft ray 1.90 (2.20–2.22) in head; first anal spine 6.86 (7.40–7.65) in head; third anal spine 3.43 (3.50–3.53) in head; longest (fifth or sixth) anal soft ray 1.97 (2.18–2.19) in head.

Upper jaw with two pairs of enlarged canines anteriorly, the first pair straight and jutting strongly forward, the second pair considerably smaller with tips recurved; 7 (4–6) close-set progressively smaller pointed teeth along side of jaw, and a very large canine posteriorly (nearly as large as anterior pair of canines); lower jaw with two pairs of enlarged canine teeth anteriorly, straight to slightly curved, the medial pair shorter; 10 (7) progressively smaller close-set teeth on side of jaw. Large molariform teeth of lower pharyngeal plate with a diagonal row of three small low conical teeth on each side adjacent to antero-lateral face, the more lateral tooth the largest.

Two or three pores in each scale of anterior straight portion of lateral line (one scale of holotype with four pores), and one or two pores in descending and straight peduncular portions (one scale of holotype with three pores).

Color of the male holotype in alcohol: head with alternating pale and dark-edged gray-brown bands (bands mainly diagonal but becoming irregular posteriorly, ventrally, and on nape); body gray-brown with continuation of irregular pale bands anteriorly from the head (ventrally they extend to posterior abdomen); most of body with dark-

Table 4. Measurements of type specimens of *Macropharyngodon bipartitus marisrubri* (expressed as a percentage of the standard length)

	Holotype BPBM 13404	Paratypes	
		BPBM 13387	BPBM 13387
Standard length (mm)	81.3	62.2	51.6
Depth of body	36.5	38.6	38.4
Width of body	13.5	12.4	13.7
Head length	31.5	33.3	33.5
Snout length	9.6	9.0	9.7
Orbit diameter	6.0	6.7	7.9
Bony interorbital width	7.4	6.4	7.0
Length of upper jaw	8.4	8.2	8.7
Least depth of caudal peduncle	17.6	16.1	16.3
Length of caudal peduncle	9.5	9.8	9.5
Snout to origin of dorsal fin	27.2	28.3	29.0
Snout to origin of anal fin	55.2	57.4	55.3
Length of caudal fin	24.3	25.9	28.0
Length of pectoral fin	22.0	22.2	22.5
Length of pelvic fin	22.6	18.7	19.0
Length of first dorsal spine	7.4	7.3	6.4
Length of second dorsal spine	8.2	8.0	7.7
Length of last dorsal spine	10.2	10.4	10.3
Length of longest dorsal ray	16.6	15.1	15.1
Length of dorsal fin base	67.0	66.9	66.9
Length of first anal spine	4.6	4.5	4.4
Length of second anal spine	6.1	6.4	6.3
Length of third anal spine	9.2	9.5	9.5
Length of longest anal ray	16.0	15.3	15.3
Length of anal fin base	41.3	38.1	38.1

edged roundish pale spots (mostly larger than pupil, some joined to form short irregular bands, particularly on side of body); pale spots not dark-edged beneath soft portion of dorsal fin and dorsally on caudal peduncle, those on caudal peduncle irregular and close-set (thus, upper part of peduncle is almost entirely pale); dorsal and anal fins gray-brown, lighter distally, with a narrow pale margin, a dark submarginal line, two rows of dark-edged pale spots and an outer short row of smaller spots in soft portion of fins; unscaled part of caudal fin pale with a large irregular dark brown "U"-shaped area posteriorly in fin, leaving only the corners of fin pale; a few faint small ring-like spots in central pale portion of fin; pectoral fins pale, the upper end of a dark-edged brown band of thorax ending at mid-base of fin; pelvic fins irregularly marked in brown and whitish, the brown primarily lateral on fin.

Color of holotype when fresh dusky red, the bands and spots on head, body, and dorsal and anal fins light green (close examination of spots and bands reveals greenish yellow centers, an inner rim of light blue and for most an outer rim of dark brown); dusky red ground color of body nearly blackish in a large area on side beginning beneath about outer half of pectoral fin, narrowing to a mid-lateral band on posterior half of body (the most red color of the body is above and below this band); distal part of dorsal and anal fins (but proximal to pale margin and dark submarginal line) red; broad pale central region of caudal fin bluish white with irregular markings of red; large "U"-shaped mark in caudal fin blackish, suffused with red; corners of fin bluish white; pectoral fins with clear membranes and whitish rays with narrow dark margins; pelvic fins reddish brown and yellow.



The females are colored in alcohol and in life like *M. b. bipartitus*.

**Remarks.**—As mentioned, the Red Sea subspecies of *M. bipartitus* is distinguished from the Indian Ocean form by the different color of the male and the lower average gill-raker counts.

All of the specimens of *M. b. marisrubri* have come from the Gulf of Aqaba. The first two were collected by David Fridman in Elat in 1967 and reported by Dor (1970) as the first Red Sea records of *M. bipartitus* and *M. varialvus*. These specimens, which are now at the Hebrew University in Jerusalem, were sent on loan, along with a specimen collected in 1969 by Victor G. Springer. Five other specimens also taken by Springer and associates were loaned from the U.S. National Museum of Natural History. The author procured four specimens in the Gulf in 1972; the one male in this series was selected as the holotype of the subspecies.

Collections of fishes in the Red Sea south of the Gulf of Aqaba have not been extensive enough to demonstrate that the subspecies is confined to the northern part of the sea. The author, however, failed to sight it during field trips to the Sudanese Red Sea in 1974 and 1975.

### *Macropharyngodon choati* new species

Figure 5D and Table 5

**Holotype.**—BPBM 14359, 75.7 mm SL, male, Australia, Great Barrier Reef, Capricorn Group, One Tree Island (23°30'S, 152°05'E), outside reef off west side of island; base of drop-off in 27.5 m, coral rubble bottom, spear, J. E. Randall, 11 January 1973.

**Paratypes.**—AMS I.16635-001, 48.8 mm SL, immature female, Australia, Great Barrier Reef, Capricorn Group, One Tree Island, channel at north end of island, .6–1.2 m, F. H. Talbot and party, 24 September 1965; AMS I.15468-001, 61.5 mm SL, Australia, Great Barrier Reef, Capricorn Group, Heron Island (23°27'S, 151°57'E), western edge of reef in 3 m, rotenone, J. H. Choat, 23 February 1967; BPBM 13444, 61.9 mm SL, female, Australia, Queensland, Fitzroy Island (17°S, 146°E, about 25 km SE of Cairns), south side of island in 5 m, spear, G. R. Allen, 6 August 1972; BM(NH) 1976.3.16.1, male, 76.3 mm SL, Australia, Great Barrier Reef, Michaelmas Cay (off Cairns), 22 m, spear, G. R. Allen, 17 August 1972; AMS I.16862-001, 33.7 mm SL, Australia,

Great Barrier Reef, Capricorn Group, One Tree Island, outer reef slope on lee side, 12 m, quinaldine, G. R. Allen, 4 October 1972; USNM 215259, 73.8 mm SL, male, same data as holotype; AMS I.17654-002, 24.1 mm SL, Australia, New South Wales, North Solitary Island (29°25'S, 153°33'E), 10–20 m, R. H. Kuiter, 2 December 1973.

**Description.**—Dorsal rays IX, 11; anal rays II, 11; pectoral rays 13, gill rakers 18 (16 to 19).

Depth of body 2.71 (2.84–2.99) in SL; width of body 2.79 (2.48–2.79) in depth; head length 2.91 (2.89–3.11) in SL; snout 3.34 (3.03–3.35) in head; orbit diameter 4.99 (4.35–5.33) in head; least depth of caudal peduncle 1.95 (1.89–2.08) in head; caudal fin slightly rounded, 1.35 (1.31–1.37) in head; pectoral fins 1.48 (1.47–1.51) in head; pelvic fins relatively short, not reaching anus, 1.86 (1.69–1.93) in head; first dorsal spine 4.35 (4.07–4.79) in head; second and third dorsal spines equal to or slightly longer than fourth to sixth dorsal spines; last dorsal spine the longest, 3.51 (3.27–3.76) in head; third to sixth dorsal rays the longest, 2.26 (2.11–2.50) in head; first anal spine 9.30 (7.48–10.70) in head; third anal spine 3.82 (3.56–4.50) in head; third to sixth anal rays the longest, 2.31 (2.20–2.50) in head.

Upper jaw with two pairs of enlarged canine teeth anteriorly, the first pair straight and jutting strongly forward, the second of about equal size but sharply recurved; 4 (3–5) progressively smaller pointed teeth along side of jaw and a canine as large as anterior canines posteriorly in jaw; lower jaw with two pairs of slightly curved anterior canines of about equal size; 8 (8–9) progressively smaller pointed teeth along side of jaw. Large molariform tooth of lower pharyngeal plate with a single small blunt conical tooth on each side.

Two or three (rarely one or four) pores in each scale of anterior straight portion of lateral line, and one (rarely two) pores in descending and straight peduncular portions.

Color of holotype in alcohol: body pale, faintly mottled with brown on nape and antero-dorsally; a faint light brown area mid-



Table 5. Measurements of type specimens of *Macropharyngodon choati* (expressed as a percentage of the standard length)

	Holotype BPBM 14359	Paratypes			
		AMS I.15468-001*	BPBM 13444	USNM 215259	BM(NH) 1976.3.16.1
Standard length (mm)	75.7	61.5	61.9	73.8	76.3
Depth of body	36.9	34.1	35.2	33.5	34.3
Width of body	13.2	12.9	12.6	13.5	13.1
Head length	34.4	34.5	34.4	34.6	32.1
Snout length	10.3	10.3	10.4	10.7	10.6
Orbit diameter	6.9	7.6	7.9	6.5	7.0
Bony interorbital width	7.5	7.3	7.4	7.1	7.3
Length of upper jaw	8.3	—	8.5	8.5	8.3
Least depth of caudal peduncle	17.6	16.5	16.7	17.3	17.0
Length of caudal peduncle	10.2	9.4	10.2	9.6	10.3
Snout to origin of dorsal fin	30.5	29.5	30.7	31.3	30.4
Snout to origin of anal fin	57.2	57.7	57.6	55.8	52.6
Length of caudal fin	25.5	25.8	26.2	25.2	24.0
Length of pectoral fin	23.2	22.8	23.4	23.3	21.9
Length of pelvic fin	18.5	17.9	18.0	17.8	19.0
Length of first dorsal spine	7.9	7.5	7.9	7.2	7.8
Length of second dorsal spine	8.3	—	8.9	7.7	8.9
Length of last dorsal spine	9.8	10.1	9.7	9.2	9.8
Length of longest dorsal ray	15.2	15.1	15.3	13.8	15.2
Length of dorsal fin base	63.7	61.5	61.5	62.8	62.7
Length of first anal spine	3.7	3.3	3.2	—	4.3
Length of second anal spine	6.0	6.2	5.8	6.1	6.5
Length of third anal spine	9.0	9.7	8.9	7.7	—
Length of longest anal ray	14.9	13.8	14.5	14.3	14.6
Length of anal fin base	37.0	35.7	39.6	36.4	36.7

\* AMS I.15468-001 was measured by the author at the Australian Museum; he failed to take upper jaw and second dorsal spine measurements of this specimen.

laterally on caudal peduncle, this nearly linked to a darker brown spot on caudal base below mid-line and a less dense spot above mid-line; head gray brown with a black blotch larger than eye on opercle centered at level of lower edge of eye; a small vertically elongate blackish mark between eye and large opercular spot and blackish markings above spot and behind it on opercular membrane; four slightly irregular horizontal narrow pale bands on head below eye and two less distinct lines running anteriorly from eye, merging with pale region at front of snout; chin pale; fins pale except for aforementioned blotches at base of caudal fin and a blackish spot on each of first two interspinous membranes of dorsal fin near base; a faint dark spot on each soft ray of dorsal and anal fins near base.

The 61.9-mm female paratype is almost identically colored; the dark areas of the caudal peduncle and fin base are even fainter on the female than the holotype and other males.

The 33.7-mm juvenile is similar but has a series of blackish dots and short lines along the back and base of dorsal fin and a few blackish dots on thorax, abdomen, and base of anal fin.

Color in life: body whitish with irregular horizontal bands and blotches of deep orange; upper half of head deep orange with a few dusky yellow blotches on postorbital region and nape, and an irregular band of bluish above and adjacent to eye, shading to yellowish behind eye; large black spot on opercle broadly bordered dorsally and posteriorly by a yellow band which is partially

edged in blue; a small blackish blotch behind eye and a bluish one in front; lower half of head with alternating bands of light blue and orange; dorsal fin deep orange with a bluish white band at base, becoming very broad in soft portion where it contains a series of large red-edged deep orange spots; median row of whitish spots in spinous portion of fin leading to a white area on most of outer part of second interspinous membrane; some yellow around blackish spots on first two membranes of fin; margin of spinous portion of fin white, of soft portion pale blue; anal fin with a red-edged orange-yellow band at base (except anteriorly where some light bluish separates it from base), a median band of light yellowish, and broad outer zone of light red; margin of fin light blue; caudal fin with pink rays and translucent whitish membranes; two large spots on scaled basal part of fin, one above mid-line of deep orange, and one below of orangish brown; pectoral fins pale, the edges of the rays light red; pelvic fins deep orange on basal half and whitish on outer half.

*Remarks.*—This species is known only from the Great Barrier Reef and eastern coast of Australia between 17 and 29.5° South. It has been collected in the depth range of 0.6 to 27.5 m but is usually seen in the deeper part of this range.

Named for J. Howard Choat in recognition of his studies of labrid fishes. When Dr. Choat collected the paratype at Heron Island in 1967 he suspected that it represented an undescribed species.

*Macropharyngodon negrosensis*

Figure 5E and 5F

*Macropharyngodon negrosensis* Herre, 1932:142  
(type locality, Dumaguete, Oriental Negros, Philippine Islands).

*Diagnosis.*—Dorsal rays IX, 11; anal rays III, 11; pectoral rays 12; gill rakers 14 to 18; anterior lateral-line scales with 2 or 3 pores; depth of body 2.67–2.94 in SL; third dorsal spine shorter than fifth and sixth spines (spines generally progressively longer,

though some adjacent spines nearly equal); pelvic fins may or may not reach anus.

Color of females from Oceania in alcohol dark brown except dorsally where there are saddle-like areas of pale yellowish (first on nape, second beneath spinous portion of dorsal fin, third beneath anterior soft portion, fourth under middle soft portion, and fifth on caudal peduncle—the first three not well separated); dark brown of head and antero-dorsally on body spotted with pale yellowish; dorsal fin pale yellowish with irregular diagonal dark brown lines in soft portion; anal and pelvic fins dark brown, the anal with a narrow pale margin, unscaled part of caudal fin abruptly pale yellowish; pectoral fins pale with a black bar at base.

In life the color is black with faint iridescent blue-green spots on body (one to three per scale); large spots of light yellow antero-dorsally on body and on head; pale areas on back light yellow with small orange blotches; dorsal fin light yellow with irregular lines of black and dusky orange except distally, those of black forming a coarse reticulum; anal fin black with a blue margin; caudal fin whitish with faint orange red dots on rays forming vertical bands, these more evident basally on whitish part of fin; pectoral fins clear, the rays edged with pink; pelvic fins black.

Color in alcohol of males from Oceania dark brown, the edges of the scales paler; the same saddle-like pale areas on back but poorly defined; head dark brown with irregular pale bands; dorsal fin dark brown with a row of large pale spots basally in spinous portion of fin and a few scattered smaller spots above; soft portion of fins with irregular pale bands on basal two-thirds of fin partially forming a reticulum; margin of fin whitish; anal fin dark brown with faint pale spots basally and a darker brown border with ray tips pale; unscaled part of caudal fin pale, the lobes broadly dark brown; pectoral fins pale with a dark bar at base; pelvic fins dark brown.

Color when fresh black, the scale edges blue-green, the pale areas on back, bands on

head, and light zones of dorsal fin light yellow; dark bands on head reddish (especially dorsally); broad outer zone of soft portion of dorsal fin dusky reddish except for a narrow whitish margin and dark brown submarginal line; a row of blue-green spots along base of anal fin, the margin bright blue; large pale portion of caudal fin whitish with dots of orange-red on rays forming vertical bands except distally; pectoral rays yellowish with pink margins, membranes clear, the dark bar at base black.

A juvenile 28 mm in SL from Palau is colored much like the females except the approximate upper half of the body is pale yellowish with a broad wavy line of demarcation from the dark ventral part of the body. A 17-mm one from the Marshalls is similar, but has a black spot on penultimate interradial membrane of the dorsal fin.

**Remarks.**—*M. negrosensis* is a relatively rare species. It is known in the literature by this name only from the holotype (SU 25516, 92 mm SL) from the Philippine Islands. The author has collected specimens from New Guinea, Solomon Islands, Palau Islands, Fiji Islands, Samoa Islands, Marshall Islands, and Ryukyu Islands in the depth range of 8 to 32 m (most specimens from depths greater than 15 m). He observed the species at One Tree Island in the Capricorn Group of the Great Barrier Reef; the Australian Museum has one specimen from this island (AMS I.15625-008, 102 mm SL) collected with explosives in 32 m by Frank H. Talbot and associates. This is the largest specimen. Gerald R. Allen collected two juveniles (WAM P25371-007, 34–38 mm SL) on the outer reef off NW Cape, Northern Australia in 15–18 m. The author examined a specimen (NTUM 4005, 73.8 mm SL) at the National Taiwan University in the care of Dr. Shih-Chieh Shen. This was obtained from fishermen at South Bay, southern Taiwan by Alexander Choi. Shen and Choi will also be reporting on this specimen.

The holotype and the Taiwan specimen (sex not determined for either, but both with male color pattern) lack any obvious light

semicircular areas dorsally on the body. Only a trace of these are evident on a specimen 52.2 mm SL photographed by Shen and misidentified as *M. meleagris* by Burgess and Axelrod (1974: 877, fig. 63).

A ripe female 61 mm in SL collected by the author in 30 m at Sesoko Island, Okinawa, on June 2, 1975, was a little different in life color from the species at islands in Oceania. The light areas on the back were dull orange with yellowish green dots; the scales of the posterior half of the abdomen were edged in orange.

### *Macropharyngodon vivienae* new species

Figure 6 and Table 6

**Holotype.**—BPBM 17934, 87.2 mm SL, male, Madagascar, off Tuléar, outer slope of barrier reef, coral flagstone, 24 m, dynamite, M. L. Vivien (now Harmelin-Vivien), 18 October 1972.

**Description.**—Dorsal rays IX,11; anal rays III,11; pectoral rays 12; gill rakers 17.

Depth of body 2.87 in SL; width of body 2.39 in depth; head length 3.14 in SL; snout 3.02 in head; orbit diameter 5.14 in head; least depth of caudal peduncle 1.92 in head; caudal fin slightly rounded, 1.31 in head; pectoral fins 1.27 in head; pelvic fins reaching anus, 1.59 in head; first dorsal spine 4.77 in head; remaining spines progressively longer, the ninth 3.16 in head; last dorsal soft ray the longest, 1.95 in head; first anal spine 6.65 in head; third anal spine 3.63 in head; last anal soft ray the longest, 2.06 in head.

Upper jaw with two pairs of enlarged canine teeth anteriorly, the first pair nearly straight and jutting strongly forward, the second nearly as large, with tips strongly recurved; 7 progressively smaller conical teeth along side of jaw, and a large canine at posterior end of jaw; lower jaw with two pairs of enlarged canines anteriorly of about equal size, the second pair slightly curved; 8 to 10 progressively smaller conical teeth along side of jaw.

Tubes of lateral-line scales with three to seven branches, those of anterior straight portion with 8 to 18 pores, of descending

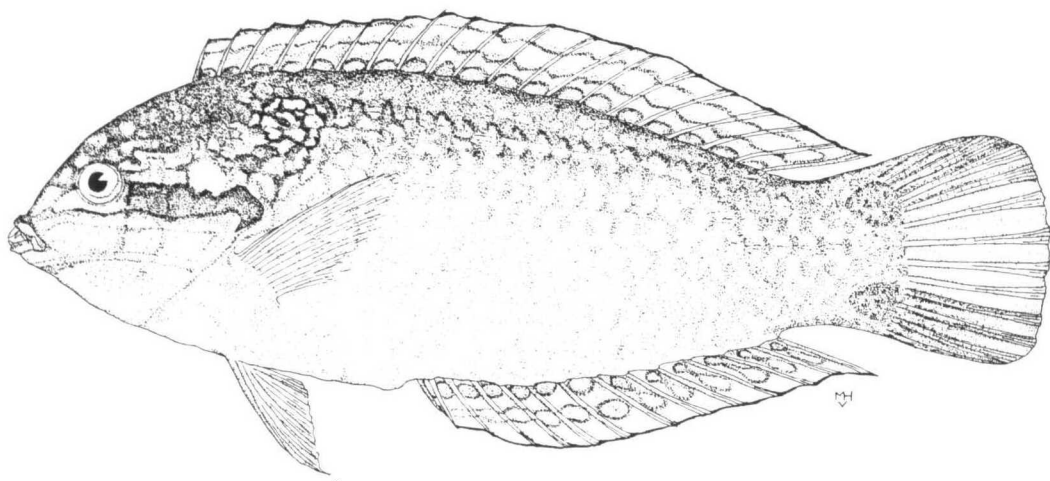


Figure 6. Holotype of *Macropharyngodon vivienae*, 87.2 mm SL, male, Madagascar, BPBM 17934 (drawing by Mireille L. Harmelin-Vivien).

part 1 to 14 pores, and in straight peduncular portion 1 to 7 pores.

Color in alcohol of holotype light brown, a little darker dorsally, the centers of the scales paler (more evident on upper side); a large (more than two orbit diameters in greatest length) oval dark brown blotch with some faint slightly paler spots in humeral region immediately above and posterior to dorsal edge of opercular membrane (opercular flap covers a little of diffuse antero-ventral end of blotch); head above a line just below lower edge of eye abruptly dark brown except for a wedge-shaped dark-edged pale band extending anteriorly from lower half of eye; eye and a white spot nearly as large as eye dorsally on opercular flap at level of eye; dorsal fin pale with a row of brown spots, one per membrane, along base; a wavy whitish band above the spots, the upper end of which is faintly edged in dark; margin of fin pale with a dark submarginal line; anal fin pale with a dark submarginal line (a little broader than the one in dorsal fin); caudal fin pale, the upper and lower margins with a narrow dark margin basally which moves into a submarginal position in outer half of upper and lower edges of fin; paired fins pale.

Color in life (from a sketch made by M. L. Vivien): A large black blotch containing irregular light blue spots centered on lateral line below second to fourth dorsal spines, this blotch joined with two dark-edged irregular diagonal light blue bands alternating with two of orange to upper edge of gill opening; back above lateral line posterior to black blotch brownish red; row of scales bearing anterior straight portion of lateral line blue with a large red spot in center of each scale; this same pattern prevails for two rows below anterior lateral line series and slightly onto a fourth row, but blue not extending as far posteriorly as first row (and progressively less for each lower row); body below blue zone with scales orangish, shading to light red ventrally, the scale centers yellow with some red; thorax yellow with two broad diagonal orange streaks; two large egg-shaped spots of deep red centered one above the other on base of caudal fin (one near upper and other near lower margin of caudal peduncle and fin); upper half of head brown (this color continuing onto nape and antero-dorsally on body to region of large black blotch) with orange spots dorsally, a triangular orange mark extending onto snout from ventro-anterior part of eye, two irreg-

Table 6. Measurements of the holotype of *Macropharyngodon vivienae* (expressed as a percentage of the standard length)

	BPBM 17934
Standard length (mm)	87.2
Depth of body	34.9
Width of body	14.6
Head length	31.9
Snout length	10.5
Orbit diameter	6.2
Bony interorbital width	7.2
Length of upper jaw	8.5
Least depth of caudal peduncle	16.6
Length of caudal peduncle	9.2
Snout to origin of dorsal fin	28.4
Snout to origin of anal fin	49.2
Length of caudal fin	24.3
Length of pectoral fin	25.1
Length of pelvic fin	20.1
Length of first dorsal spine	6.7
Length of second dorsal spine	7.6
Length of last dorsal spine	10.2
Length of longest dorsal ray	16.4
Length of dorsal fin base	69.6
Length of first anal spine	4.8
Length of second anal spine	6.8
Length of third anal spine	8.8
Length of longest anal ray	15.5
Length of anal fin base	44.8

ular horizontal greenish yellow bands passing posteriorly from eye (one from above center of eye running to above upper end of gill opening and the other from lower part of eye to posterior end of opercular flap where it curves slightly downward); a bright yellow spot nearly as large as eye on dorsal part of opercular flap at upper end of gill opening; lower half of head orangish, becoming yellow anteriorly to mouth region, a diagonal segment of yellow running upward on side of snout from edge of upper lip; lips orange, shading posteriorly to yellow; a horizontal narrow blue band passing from snout just under wedge of orange, beneath lower greenish yellow band, to edge of opercular membrane, thence, downward along edge of membrane to level of midbase of pectoral fin, then continuing forward as a second narrow band to chin; dorsal fin light red with a median stripe of yellow, edged in darker red, containing in its lower

part a row of blue spots; another row of blue spots, edged in red, along base of fin; a submarginal black line in fin; anal fin light red with a lower row of red-edged blue spots (smaller posteriorly), one per membrane, and farther out a row of large red-edged orange spots (last six orange spots elongate parallel to rays, joining basal blue spots); fin with a pale blue margin and black submarginal line; unscaled part of caudal fin with a large centro-posterior area of bright yellow bordered above and below by a broad band of red; posterior part of upper and lower edges of fin with an orange border set off by a black line which becomes marginal on basal half of fin; scaled basal part of fin colored like body except for the aforementioned two large oval red spots; pectoral fins pale; pelvic fins yellow with a lateral margin of orange; iris orange with a ring of blue.

**Remarks.**—Known only from the male holotype from Madagascar. Most of the species of *Macropharyngodon* exhibit marked sexual dichromatism (*M. choati* and to a lesser extent *M. geoffroy* are exceptions). It seems probable, in view of the complex color pattern, that this species will have a female phase of different color. One might expect, for example, that the black humeral spot will be absent in the female, as it is in *meleagris*.

Named in honor of Mireille L. Harmelin-Vivien who collected and illustrated the holotype.

***Macropharyngodon kuiteri* new species**  
Figure 5G, 5H, and Table 7

**Holotype.**—BPBM 19632, 60.5 mm SL, female, Australia, New South Wales, Seal Rocks (31°26'S, 152°32'E), 10 m, hand net, R. H. Kuitert, 13 January 1973; reared to 60.5 mm in Kuitert's aquarium; preserved 26 February 1974.

**Paratypes.**—USNM 215261, 47.1 mm SL, Australia, New South Wales, Seal Rocks, 5 m, hand net, R. H. Kuitert, 29 April 1973; BPBM 19906, 76.2 mm SL, male, same data as preceding but maintained over 2 years in Kuitert's aquarium; BPBM 19633, 61.7 mm SL, Australia, New South Wales, Seal Rocks, 15 m, hand net, R. H. Kuitert, 27 October 1973 (collected as a juvenile; main-

Table 7. Measurements of type specimens of *Macropharyngodon kuiteri* (expressed as a percentage of the standard length)

	Holotype BPBM 19632	Paratypes				
		USNM 215261	CAS 34698	BPBM 19633 <sup>1</sup>	MNHN 1976-4	BPBM 19596
Standard length (mm)	60.5	47.1	49.6	61.7	76.6	80.2
Depth of body	36.4	35.4	34.1	33.4	36.8	34.2
Width of body	12.5	12.2	11.9	—	12.6	11.6
Head length	35.4	34.3	34.8	34.4	34.2	34.3
Snout length	10.7	10.6	10.3	10.1	10.5	10.6
Orbit diameter	7.5	7.7	8.2	7.6	7.8	7.3
Bony interorbital width	7.6	7.8	7.7	8.1	7.2	7.5
Length of upper jaw	8.6	8.3	8.3	8.3	8.6	8.6
Least depth of caudal peduncle	17.4	17.2	16.2	17.0	15.7	16.1
Length of caudal peduncle	7.2	6.8	6.8	7.1	6.7	7.8
Snout to origin of dorsal fin	30.6	29.7	30.4	29.2	29.6	28.7
Snout to origin of anal fin	51.7	53.3	52.5	49.6	54.2	53.0
Length of caudal fin	26.8	28.4	28.0	27.9	25.3	28.3
Length of pectoral fin	24.4	23.9	—	22.7	24.1	24.7
Length of pelvic fin	18.8	20.2	19.5	21.4	18.8	21.0
Length of first dorsal spine	6.1	6.6	6.4	6.3	5.4	4.9
Length of second dorsal spine	7.6	8.5	8.1	7.9	6.8	5.7
Length of last dorsal spine	10.2	9.8	10.1	10.0	8.9	10.0
Length of longest dorsal ray	16.8	16.4	15.7	15.4	17.2	16.8
Length of dorsal fin base	69.6	66.8	65.3	71.0	65.2	69.8
Length of first anal spine	4.5	4.7	4.9	4.9	3.9	3.8
Length of second anal spine	6.1	6.2	6.3	6.3	5.2	4.6
Length of third anal spine	8.6	9.5	9.3	9.6	7.9	8.1
Length of longest anal ray	16.7	15.7	15.7	16.2	16.6	17.7
Length of anal fin base	44.7	44.3	44.2	45.5	41.8	45.0

<sup>1</sup>BPBM 19633 ceased to feed in the aquarium and became very emaciated. Measurement of width of body therefore eliminated.

tained in Kuiters' aquarium until 26 February 1974); CAS 34698, 49.6 mm SL, Australia, New South Wales, Clovelly, Sydney Harbor, 8 m, hand net, R. H. Kuiters, 2 February 1974; BPBM 19596, 80.2 mm SL, male, Australia, Great Barrier Reef, Capricorn Group, One Tree Island, SW drop-off in 30 m, spear, B. C. Russell, 21 September 1974; AMS I.18093, 68 mm SL, female, same data as preceding; MNHN 1976-4, 76.6 mm SL, female, New Caledonia, outside barrier reef off false pass Uitoé (about 3 km N of Dumbéa Pass), 55 m, coral rubble, sand, and brown algae, rotenone, P. Laboute and Y. Magnier, 5 November 1975.

**Description.**—Dorsal rays IX,11; anal rays III,11; pectoral rays 12; gill rakers 17 (16 to 19).

Depth of body 2.74 (2.72–2.93) in SL; width of body 2.90 (2.36–2.94) in depth; head length 2.82 (2.87–2.92) in SL; snout 3.31 (3.23–3.40) in head; orbit diameter 4.72 (4.24–4.57) in head; least depth of caudal peduncle 2.03 (1.98–2.19) in head; caudal fin slightly rounded, 1.32 (1.21–

1.35) in head; pectoral fins 1.45 (1.38–1.51) in head; pelvic fins usually reaching anus, 1.88 (1.61–1.82) in head; first dorsal spine 5.8 (5.2–7.0) in head; remaining spines progressively longer, the ninth 3.47 (3.43–3.85) in head; penultimate dorsal ray the longest, 2.11 (1.98–2.23) in head; first anal spine 7.88 (7.01–9.0) in head; third anal spine 4.12 (3.61–4.52) in head; penultimate anal ray the longest, 2.12 (1.93–2.22) in head.

Dentition of jaws unusual, the teeth more or less spatulate except large canine at corner of mouth (posterior end of upper jaw); two pairs of enlarged teeth anteriorly in upper jaw, the anteriormost the longest and moderately pointed as a result of distinct beveling of outer third of tooth (bevelled edges often slightly concave, especially the lateral); second pair of enlarged teeth broadly sub-



truncate, strongly buttressing anterior pair, the 5 (4-6) remaining small teeth on side of jaw subtruncate to broadly rounded, the lowermost corner projecting downward by virtue of the teeth angling forward; teeth of lower jaw similar, the median anterior pair not so broad, the second pair proportionately longer, the small teeth on side of jaw 7 (6-8). Large molariform tooth of lower pharyngeal plate with a bicuspid-like tooth (more posterior cusp the largest) to each side, its greatest diameter about one-third diameter of molar; each bicuspid with a small conical tooth to one side and one to the front.

Two (rarely one or three) pores in each scale of anterior straight portion of lateral line, and usually one (rarely two or three) in descending and straight peduncular portions.

Color in alcohol of females pale with a black spot as large as eye on opercle and opercular membrane at level of eye; a small blackish spot behind eye at level of upper edge of eye; a small median dusky spot on snout directly anterior to eyes; a similar spot mid-ventrally on chin (absent on 47.1 and 61.7-mm paratypes); a small dusky spot on first interspinous membrane of dorsal fin.

Color in alcohol of males similar, but with some dusky pigment in a broad central area of each scale on upper part of body, a broad blackish zone mid-dorsally on head from snout to origin of dorsal fin, and a longitudinal blackish streak mid-ventrally on gill membranes; also the black spot anteriorly in the dorsal fin continues onto the second interspinous membrane.

In life females are orange-red with a bluish white spot on each scale (relative amount of white coloration increasing ventrally until on abdomen and lower head the pattern is predominantly whitish with small light orange-red spots); pale spots dorsally on head, nape, and back more blue than white; a large black spot prominently rimmed in light blue on operculum at level of eye; a small blackish spot behind upper edge of eye; a small median blackish spot surrounded

by light blue on snout in front of eye; dorsal and anal fins dull yellow with three or four rows of dark-edged pale spots (light blue in dorsal, bluish white in anal); caudal fin whitish with alternating small spots of dark-edged light bluish and pale orange-yellow forming vertical bands; pectoral fins pale yellowish, the edges of rays light red; pelvic fins olivaceous yellow, transversely banded with bluish white laterally, shading to whitish medially; iris blue and yellow.

Color of the male paratype (80.2 mm SL): from a Kodachrome transparency taken by Kuitert: body orange-yellow, the centers of the scales antero-dorsally reddish, gradually becoming broadly whitish (leaving only a narrow rim of orange-yellow on scales) on rest of body; head with six broad irregular orange-yellow bands edged narrowly with reddish, radiating from eye (though none ventrally), the largest passing horizontally across operculum in a sinuously curving path from lower edge of eye to margin of opercle, linking with a narrower band passing beneath pectoral fin near axil; head below horizontal band (and a short one running anteriorly from lower edge of eye) pale green with a wash of purple and two short horizontal bands of yellow; snout, chin, and mid-dorsal region of head light green; a black spot as large as eye posteriorly on operculum at level of eye, this spot bordered anteriorly and posteriorly with green and ventrally by the aforementioned orange-yellow band; a small blackish green spot behind upper edge of eye; dorsal fin orange-yellow with green bands narrowly edged in reddish (three oriented horizontally in spinous portion except anteriorly, the middle row a series of spots, and mainly diagonal but irregular in soft portion); anterior part of fin with a band of green on each of first four rays and adjacent membranes (broader basally in fin) and a blackish spot near base on each of first two interspinous membranes; anal fin yellow-orange with two horizontal green bands narrowly edged in magenta, the broadest basally in fin; dorsal and anal fins with a narrow

blue margin and dark submarginal lines; caudal fin with narrow alternating orange-yellow and dark-edged light blue vertical bands and a blue margin (broad on corners, narrow posteriorly); pectoral fins whitish, the rays narrowly edged in light reddish; pelvic fins greenish white; iris mainly orange and yellow with a narrow ring of greenish.

Small juveniles are dull orange with bluish white spots on body, many interconnected to form irregular bands; two black spots present on postorbital head as in adults, both broadly rimmed in blue; dorsal and anal fins with two ocelli (both fins with one posteriorly, the dorsal with one near center and the anal with one near front of fin) which are black with blue centers, rimmed in yellow. The last ocellus to disappear with age is the one posteriorly in the dorsal fin. The 47.1-mm juvenile has a vestige of this spot on the tenth soft ray.

*Remarks.*—This species is presently known only from the Great Barrier Reef, eastern Australia south to Sydney and New Caledonia.

The author first saw a juvenile (about 25–30 mm TL) in an aquarium at the Kuiter residence in Sydney. It was recognized as a *Macropharyngodon*, but the species was unknown. Mr. Kuiter kindly reared the fish to adult size and shipped it alive to the Bishop Museum where it was killed, photographed, and preserved as the holotype. The species is named in honor of Mr. Kuiter.

With its distinctive dentition and one additional dorsal and anal fin ray, *M. kuiteri* is the most divergent species of the genus.

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DATE ACCEPTED: November 8, 1976.

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